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HERALDING THE 21st CENTURY - 29 (b)

Frontiers of Science — Can man penetrate the mind?

Since the dawn of human mind on earth from the days of ancient Hindu mystics and Greek philosophers, scholars have struggled o find analogies to explain the machinery of the mind and in all heir ponderings, mind has not always been associated with the brain. ristotle thought of the brain as a radiator "Thinking is done by he heart and the brain cools the blood". Seventeenth Century French athematician and philosopher Descartes viewed the mind as a achine in which the nerves were likened to the plumbing of the ountains. The (pseudo) science of phrenology in the nineteenth cenry assigned specific mental powers to precise areas of the brain.

Through the 20th Century, scientists have tried to make machines at mimic the brain's functions and even the most powerful super mputer falls far short of the real thing. The prehistoric efforts of e apeman to 'speak' and the gradual evolution of "a language" nstituted the first milestone of the activity of the mind. Today wentieth Century technology is confronting seventeenth century hilosophy as modern neurologists peer into our restless brain to lock the secrets of language.

PET, position emission tomography is one of the latest tools, used some 40 centres in the United Stated both for research and diagstic purposes. The technique uses substances such as blood, or ucose, tags them with a radioactive label, then traces activity within targetted organ — in this case the brain. Today PET produces ages not of brain's anatomy but those of brain doing its work.

Projected in psychedelic colours on the screen, they show difrent parts of the brain lighting up as people read, listen, speak even think about a word's meaning. With these pictures, the ain's ability to handle language — mind's crowning evolutioning hievement — can be watched in action. The remarkable work at ashington University School of medicine, St. Louis gives us a winw into the three pound mass of nerves inside our head, highlightg the regions that truly make us different from all other animals.

PET images of brain activity are obtained by tracing blood flow tterns since blood is brain fuel (so to speak). When a particular rt of the brain increases its level of activity, more blood is shunted wards the site. PET has also begun to explore another bridge —that tween words and the things they symbolise — where in our brain we attach meaning to words — a spot which for the philosoers and scientists, should really portray the 'mind'?

Classical neurology places the brain center for meaning and comehension near the auditory cortex. But this area fails to light up ring PET experiments. Instead three major areas light up during PET experiment — the right cerebellum, a cluster of areas in the left frontal cortex, and a region in the middle of the Frontal Cortex.

Dualism, the metaphysical separation of body and the mind is a concept advocated by the seventeenth century philosopher Descartes. He proposed that the human body including the brain, was essentially a machine whose functioning could be described by the mathematical laws of physics. But Descartes believed that all structures of the brain exist in double form except the pineal gland which became the seat of consciousness and the Soul — the site of the pure immaterial mind that guides us as we read, write and talk.

Today of course, there is hardly any respectable neuro scientist alive who thinks that the mind exists apart from the functions of the physical brain and the body; yet what the philosophers have called — the spirit — the ghost in the machine —the dualistic mind of Descartes, continues to haunt the efforts of the scientist to describe human cognitive functions of language.

Recent research is revealing fascinating new answers to questions about the brain that have tantalized thinkers for centuries: How does the brain recognize faces, smells and sounds; recall distant memories; make intuitive leaps? "Imagine a block of wax ....." So wrote the Greek philosopher Plato more than 2,000 years ago to describe memory. Since then, scholars have invoked clocks, telephone switchboards, computers — and even a cow's stomach —in equally futile attempts to explain the mysterious workings of the brain.

But an explosion of recent findings in brain science — aided by new computer programs that can simulate brain cells in action —is now revealing that the brain is far more intricate than any mechanical device imaginable. For the first time, brain researchers are beginning to explain how the brain can call up distant memories from a vast storehouse of recollections and instantly recognize faces, odours and other complex patterns — tasks that even the most powerful electronic computers stumble over.

From a combination of computer simulations and biological experiments, a radically new picture of the brain is emerging: Brain cells are tied together in complex networks that allow them to quickly recognize patterns such as smells and call up related memories.

1. The odour of a rose is picked up by nerve cells in the nose, which transmit signals to a part of the brain's cortex that is responsible for categorizing and recognizing odours.

2. There, the incoming signals trigger a pattern of electrical activity in a network of neurons. Because of background odours or sight variations from rose to rose, the signal is not the same every time. The brain must identify the smell not by making an exact match but by recognizing fundamental similarities to a pattern stored in its memory.

3. The neurons in the network do this by communicating with one another to find the best match between the incoming pattern and one stored in memory. Pieces of the incoming pattern that resemble a stored pattern are reinforced; those that don't match are weakened. By this process, the incoming signal evolves to the pattern it most closely resemble, and the incoming smell is recognised.

4. The brain's circuitry for smell is closely tied to other areas involved in the storage and processing of memory which may explain why a smell can trigger an onrush of memories from the distant past.

Scientists are now coming to regard the brain as far from some kind of orderly, computerlike machine that methodically plods through calculations steps by step. Instead, the new image of our "engine of thought" is more like a beehive or a busy marketplace seething swarm of densely interconnected nerve cells — called neurons — that are continually sending electrochemical signals back and forth to each each other and altering their lines of communication with every new experience. It is in this vast network of neurons that our thoughts, memories and perceptions are generated in a cellular version of a town meeting.

This new view of the brain has burst into every corner of science where researchers think about thinking. Brain scientists hope that a new theory of how the mind works will lead to ways to control afflictions such as epilepsy and Alzheimer's disease. Computer researchers are looking at how the brain computes in an attempt to give robots eyesight, hearing and memory and to build brainlike machines that can learn by themselves. The new model of the mind even has philosophers dusting off hoary questions about the nature of rationality and consciousness.

The revolution in understanding the brain has come about because of a marriage of two widely different fields — neurobiology and computer science. For years, computer researchers attempting to create machines with humanlike intelligence all but ignored the complex details of the brain's anatomy. Instead, they tried to understand the mind at the more theoretical level of psychology — that is, in terms of the brain's behaviour.

Neuroscientists, meanwhile, were focusing on the brain's biology, using microscopic probes to sample electrical pulses from the 100,000 million neurons that make up the brain and trying to unravel the chemistry of how those neurons communicate with one another. Many neuroscientists, however, are now realizing that the brain is far more than the sum of its parts. "Suppose you wanted to know how a computer worked," says Koch. "You could sample the signals at all the transistors, and you could crush some up and see what they're made of, but when you were finished you still wouldn't know how the computer operated. For that, you need an understanding of how all the parts work together."

With the development of powerful computers and the expansion of knowledge about the brain's anatomy, researchers are finally teaming up with computer scientists to simulate the way neurons might [illegible] together in the vast networks that make up our mind. No one [illegible] this new approach will explain, neuron by neuron, how [illegible] or laugh with Charlie Chaplin. Nor is it yet clear whether different types of neural networks are responsible for producing all the remarkable things the brain can do. But researchers are beginning to see the outlines of the brain's remarkable organization, which allows it to learn new skills, remember old events, see and hear and adapt itself to new situations.

Laboratory models of the brain — called neural networks — consist of a dozen to several hundred artificial neurons whose actions are simulated on a conventional digital computer. Just as a single neuron in the brain is connected to as many as 10,000 other neurons, each artificial neuron in a neural network is connected to many others, so that all the nerons can send signals to one another. Simple rules that mimic how actual neurons alter their communication pathways in the brain are programmed into the simulations as well.

The result is a device that shares some properties with the real thing but is far easier to take apart, examine and run experiments on. "These things aren't toys," says Richard Granger, a brain researcher at the University of California at Irvine who uses neural shading, individual neurons within the network actually responded with the most activity when he later tested the network not with curved surfaces but with bars of light. Fact, the neurons responded just like the specialized neurons in the monkey's brain discovered years ago by Hubel and Wiesel — neurons that had long been assumed to be involved in helping the brain detect the straight edges of objects, not their curvature. "My network doesn't prove that those cells in the monkey's brain are actually there to compute curvature and edges," says Sejnowski. "But it does mean that you can't make quick assumptions about what the entire brain is doing simply by sampling what individual neurons are doing. You need to look at the system as a whole." Several neuroscientists, inspired by Sejnowski's study, plan to investigate whether such curvature-computing cells actually exist in the brain.

The ability of neural networks to learn to simulate these brainlike tasks has also inspired researchers to create machines that act more like real brains. While conventional computers can perform powerful feats of number crunching, they are dismal failures at doing more brainlike operations such as seeing, hearing and understanding speech things we usually take for granted but that are extremely complex computationally. "The things that distinguish us from monkeys, playing chess, for example are easy for computers to do," says Koch. "But when it comes to doing things we share with the animal kingdom, computers are awful. In computing vision or movement, for example, no computer comes even close to matching the abilities of a fly."

It may be long time before anybody is able to build a machine that actually works like a brain. After all, nature has had a seven million-year head start on engineers, and researchers have never encountered anything as complex and ingeniously designed as the 1.35 kilogram lump of tissue inside our skulls.

Meanwhile, the first steps at understanding how the brain really works have already been taken. Many brain researchers now believe that the bigger mysteries of how we make choices and use languages — or why some memories last forever while others fade — will inevitably yield their secrets. Even the nature of the brain's creativity, attention and consciousness may someday be revealed. "Basically, the brain is a neural network—however complicated," says Andersen. "It will take time, but we will solve it."

— T.P.S. RAJAN.

(Source: (1) The Mind in motion by Geoffrey Montgomery. *Discovery*, March 1989; (2) Our Wonderous Brain by William Allman. *Span*, September, 1989.)

CHEMARENA

S.L. VENKITESWARAN

Petro-Complexes — the more the merrier?

When our industrial policy is flexible and accommodative and with liberalising of licencing regulations for projects of up to Rs.50 crores investments, it is not surprising that a spate of new projects get approval, more so when elections are approaching. These columns have on several occasions referred to the need for a clear idea of sectoral investments in the light of overall realistic financial resources for the Plan. This would avoid lopsided developments and investments. In the case of chemicals and polymers it is all the more essential that targets are in consonance with the utilisation patterns and downstream targets which include automobiles, appliances, construction, packaging and so on for which the investment needs are 3 times or more than on the base polymer. The impact on feedstock supplies, more so with reference to indigenous availability has to be properly evaluated so that imports of petroleum feedstocks do not contribute to the burden on balance of payments.

The Kapur Committee on petrochemicals had elaborated a massive programme for petrochemicals which even on conservative estimates required investments of the order of Rs. 20,000 crores at 1986 prices. In the wake of this it was reported that the Planning Commission had studied the pros and cons and come to the conclusion that there has to be a policy of approval of selected projects consistent with our resources. It was mentioned that in the 8th plan priorities will be for MGCC which is under construction (an advanced stage), Reliance Petro, which has started construction and a gas cracker at Auriya in UP and perhaps Haldia Petrochemicals in West Bengal. But what we have seen in recent months is a spate of approvals of massive projects both in the public and private sectors which need investment of the order of 15,000 crores on the basic products alone.

The real problem is on the utilisation of natural and associated gases which are said to be available in plenty and may be flared away (particularly the associated gases) if not utilised. We have now reached a stage for using up the available gases from existing operations gainfully for fertilisers, power plants, sponge iron, and other areas. A cross country pipeline of 1,800 km. has been laid for taking the gases from Gujarat to far off UP/Delhi and three fertiliser plants and two power plants along the route are nearly complete. In the case of natural gas it is possible to tap the wells and regulate production in line with consumptions. But the problem is of using the hydrocarbons other than methane for uses other than for ammonia or power or energy source. The C2 (ethane) and higher condensibles are 5 to 8% of the gas and the right policy is to use them for petrochemicals instead of using them along with methane for ammonia or energy source. These have to be separated out and the C3/C4 is diverted for domestic fuel use from the associated gas of oil production in Bombay High. The C2 with some C3 is now also separated for use in the MGCC.

The natural gas of Bassein fields are said to pose more difficulties in separation. The first separation plant at Hazira may remove only C4 and higher with some C3 fraction and these will be used by the Reliance Petrochemicals. The bulk of C3 and ethanes go along with the methane and separation of these are only at downstream points — Jagdishpur for propane and Auriya for ethane — where their use for petrochemicals has to be undertaken. The propane is to be dehydrogenated to propylene and then polymerised to propylene by GAIL in Jagdishpur. The ethane separated at Auriya is the base for the gas cracker complex there. These projects are inevitable if we are to get optimum value from all components. But even then some of the C3 and C2 are used along with methane in plants along the route upto Auriya.

There is no compulsion for the use of liquid hydrocarbons from refineries such as naphtha, though any C3/C4 gases from the cracking of heavy distillates have to be put to good use. The propylene of Cochin, Madras and Vizag. refineries are linked to conversion plants. The surplus from the Bombay Refineries was to be drawn by the MGCC cracker but apparently there is some hitch and the news was that there will be surplus for other projects. The decade long Haldia project is yet to get final clearance and there is perhaps a justifiable suspicion that it is being crowded out through approval of many other projects ahead of it.

Apart from the Jagdishpur and Auriya projects linked to the HBJ pipeline there is need to use the condensates and ethane associated with the Gandhar oil field which is under high priority for exploitation. Hence the late approval of Gandhar petrochemicals complex to be taken up by IPCL. But there are no such technical compulsions to establish naphtha-based crackers at any other centre — whether

Madras, Vizag. or Bombay and perhaps other considerations have cropped up for granting approvals even in the face of the reported Planning Commission and cautions and before the Petrochemical Development Authority gets going.

There are other aspects also in regard to the rapid-fire developments of giant projects centred on churning out hundreds of thousands of tonnes of polymers in the course of two years. Processing these enormous amounts into products of value to the economy needs years of sustained efforts as was the experience of NOCIL and IPCL in their early years even with their production in thousands of tonnes. Giant petrochemical complexes take a few years before earning reasonable profits and must be able to survive this period. There are far too many and complex factors which affect the market buildup.

Meanwhile, the advance build-up of capacity based on imported olefines appears to have run into serious problems related to landed costs. The country is already saddled with continued imports of butadiene and heptene/nonene for synthetic rubber and oxo alcohols. The claims of exports to cover imports has generally been a mirage and there is little hope of any better prospects in the coming years. Certainly the country should avoid enormous commitments for imports intermediates. Imports of LNG is a different matter as it a widely traded petroleum product but our problem is o of relatively plentiful liquid fractions.

The brief list of approvals for olefine complexes in the la year or so is in the Table. It is time to take stock of the si uation and arrive at some programme of proper timin between projects of this magnitude.

Table

(Tonnes

	Ethylene	Propylene others
MGCC, Nagothane	300,000	70,000
Reliance Petro, Hazira	350,000	150,000
IPCL, Gandhar	350,000	70,000
GAIL	--	120,000
GAIL, Auriya	300,000	60,000
UB Petro, Vizag	300,000	100,000
Haldia, WB	150,000	75,000
NOCIL, Thane-Belapur	250,000	190,000
Linde/Goenka, Madras (Export)	350,000	150,000

High Fructose Corn Syrup — HFCS

The current shortage and high prices for sugar once again focusses on the alternative of HFCS based on maize. In USA, the production and use of HFCS accounts for about 40% of all sweetners and invariably in the industrial use for beverages and bakery products.

We have a few projects under construction for maize processing to starch and glucose but apparently not including HFCS which involves one of the most modern enzyme technology. The glucose isomerase enzyme is produced by several microbes and present methods of conversion involve the use of the enzyme solubilised and fixed on DEAE cellulose so that the reaction is continuous for several days with the same enzyme pack. An alternative is to use the whole cells for immobilisation and packed in tower reactors. There are three main suppliers of the enzyme/cell system — Miles Laboratories of USA and Gist Brocades and Novo Industries, both of Denmark but with operations in USA. The conversion process is based on dextrose syrup as per conditions reported for the three processes as under. The stages are filtration of the syrup, pH adjustment, conversion, ion exchange treatment, carbon treatment if required and final evaporation to required strength.

Reactor type	Gist Brocades Downflow	Miles Downflow	Novo Downflow
Temperature	58-60°C	60°C	61°C
pH at 25°C			
Inlet	7.5	7.5	8.2
Outlet	6.8	6.5	7.8
Mg. ppm.	125	50-100	10-150
Ca ppm.	<3	<2	1-15
Dry solids in % feed	40-45	40-45	40-45

Magnesium ion is essential and has to be removed by ion exchange after the reaction. There are also other producers and uses of the enzyme.

The costs of conversion are not readily available and depend very much on the enzyme, its costs and extent of continuous run. Under today's conditions it would be worth while if HFCS production is taken up in an integrated complex from maize if supplies are assured of 20,000 to 50,000 tonnes a year at a fixed fair price.

Cheminor Drugs to set up drug plant near Vizag

Cheminor Drugs, belonging to Dr. Reddy's group, proposes to set up the country's largest synthetic drug project in the private sector near Vizag, Andhra Pradesh at a cost of Rs. 21 crores. The company is the world's third largest and Asia's largest manufacturer of ibuprofen according to Dr. K. Anji Reddy, the Chairman.

To part finance the new project, the company proposes to issue 75,875 -14% secured fully convertible debentures of Rs. 420 each amounting to Rs. 318.67 lakhs to the public on November 6. In addition, it has resevered 6,625 debentures for its employees and also those of the promoters' companies and 50,000 debentures for non-residents. The total issue is 1.32 lakhs debenture, aggregating Rs. 556.50 lakhs.

An attractive feature of the issue is that Rs. 100 out of Rs. 420 per debenture will be converted into five equity shares of Rs. 10 each at a premium of Rs. 10 per share (issue price Rs. 20) on the date of allotment of debentures. The balance Rs. 320 will be converted into equity shares on December 1, 1991 at a premium to be decided by the Controller of Capital Issues at that time.

The company is doubling the ibuprofen capacity to 1,200 tonnes per annum from the existing capacity of 600 tonnes. Besides it will manufacture other critical drugs for the first time in the country like diltiazem, a cardio vascular drug, which is well on its way to becoming a billion dollar drug in the world market as per the reckonings of Dr. Reddy and gemfibrozil, an anticholesterol drug.

It already has firm arrangements for the sale of ibuprofen and has the added advantage of having the approval of the Food and Drug Administration (FDA) of the U.S. for its existing project, Dr. Reddy has added.

Today, over 90% of the total production of its ibuprofen is being exported to prestigious markets like the US., West Germany, Japan, Russia, Poland etc. Dr. Reddy revealed that phenomenal success of the company in the world market was on account of its technology, developed indigenously, which has over the years reduced the costs of ibuprofen without compromising on its quality. This has directly resulted in the company being able to capture markets, especially overseas, and expand the operations of the company.

The proposed expansion of ibuprofen is expected to be completed by June 1990.

WORKSHOP ON 'CORROSION CONTROL AND MONITORING'

A one day workshop on 'Corrosion Control and Monitoring' has been organised jointly by Central Electrochemical Research Institute (CECRI), Karaikudi and Oil and Natural Gas Commission (ONGC), Dehradun on 23rd October at Madras. The workshop will be inauguarated by Mr. S.K. Manglik, Member (Technical), ONGC and will be presided by Prof. S.K. Rangarajan, Director, CECRI, Karaikudi. The workshop will address the various corrosion problems faced by ONGC in the production and transportation processes of oil and gas and analyse the various methods of corrosion control and monitoring as applied to the specific area by presenting case studies on corrosion failures. The workshop will also identify areas of immediate concern to oil and gas industries and work out methodologies for cooperation between ONGC and CECRI in minimising the damages due to corrosion in this vital sector.

About 40 Engineers from ONGC and 20 Scientists from CECRI are expected to participate in the workshop.

The Engineers will later visit CECRI, Karaikudi, the Corrosion Testing Station at Mandapam Camp as well as the Offshore Platform for Marine Corrosion and Biofouling at Tuticorin and hold discussions with the scientists on the facilities available for the development of various anti-corrosion products and processes for use in this industry especially in the fields of corrosion inhibitors, cathodic protection, suface coatings and biocides and antifoulants.

US, W. GERMAN SCIENTISTS GET NOBEL PRIZE FOR PHYSICS

US scientists Norman F. Ramsey and Hans G. Dehmelt and West German Wolfgang Paul shared the Nobel Prize for Physics, the Royal Swedish Academy of Sciences announced at Stockholm on October 17.

Dr. Ramsey, of Harvard University, was awarded half the prize for inventing the separated oscillary fields method and its use in atomic clocks. Dr. Dehmelt, who was born in Germany and is associated with the University of Washington in Seattle, and Dr. Paul, of the University of Bonn, shared the second half of the 469,000 dollar prize for the development of the ion trap technique, the academy said. "All three of them have developed exact methods of measurement which has made it possible to conduct experiments that might force us to reconsider some basic physical laws, especially regarding time and space," said Ingvar Lindgren, Chairman of the awarding committee.

Chemistry

American Thomas Cech and Canadian Sidney Altman shared the Nobel Prize in Chemistry for their work with the genetic material RNA. Mr. Altman, 50, and Mr. Cech, 41, were cited for their surprising discovery of the catalytic function of RNA, or ribonucleic acid, which had been thought to be only a hereditary molecule, the academy said.

Haldia Petrochem project foundation laid

While accepting the West Bengal government's demand that the Haldia petrochemicals project should be implemented within a given timeframe, the Prime Minister, Mr. Rajiv Gandhi said at Haldia on Oct. 15, that the state should initiate work on the downstream projects immediatley, without waiting for the completion of the mother plant.

Laying the foundation stone of the proposed nearly Rs. 3,000 crore project, the PM said, he had discussions with the chief minister, Mr. Jyoti Basu, in this regard while they were together on their way from Delhi to this township.

Neither the Prime Minister nor Mr. Basu was in a mood to dig up the past to find the causes as to why the project was delayed for 12 years. The Prime Minister only said, "Mr. Basu had doubts about the central clearance of the project; but I am myself here today to see that it is done. And it must be done fast".

A project like Haldia petrochemicals should help the state to regain the lost momentum. The petrochemicals project, he said, was no ordinary industry, it would be the parent industry for so many other small, medium and large industries in the region. The state must make the best use of the petrochemicals project.

The development of the downstream industries should be taken up with all seriousness and speed by the state, so that the maximum employment could be generated. (According to a figure quoted by Dr. Asim Dasgupta in his welcome address, the project was to generate employment for at least 150,000 people).

Mr. Basu, who presided over the ceremony, said that he would not reiterate the bitterness that the delay of the project had created between the Centre and the state. But the delay had escalated the project cost from Rs. 500 crores to Rs. 3000 crores. "We would not like further delays and increase the project cost from Rs. 3000 crores to Rs. 6000 crores", he said.

He agreed with the Prime Minister that utmost importance should be given to downstream projects for the overall economic development of the region. Since the products would benefit the poor, the middle class and the rich, he called for total involvement of the people in the project.

He made it clear that the development of West Bengal meant development of the country. "Elections and governments will come and go; but such a project would stay for the state's prosperity", he added.

HALDIA COMPLEX TO HAVE NEW FOREIGN PARTNERS

In a significant development, Haldia Petrochemicals Ltd. (HPL), the executor of the much-talked about Rs. 2,846-crore project, is going to have a new foreign technical and financial collaborator replacing Linde Ag of West Germany.

According to highly placed sources, HPL is now considering a new collaborator from among Snam Progetti of Italy, John Brown of the UK, Toyo of Japan and a comparatively new but upcoming Spanish company. However, the other original foreign collaborator, Chemtex of the US would remain where it was without any change of status.

As it transpired, HPL, a joint venture of the West Bengal Government and Mr. R.P. Goenka of the RPG Enterprises, had decided in principle to skip Linde because of its present involvement in the Madras-based project promoted by RPG Petrochemicals Ltd. (also of Mr. Goenka). Currently the feeling is, if associated with the Haldia project, Linde might itself be overstretched.

The 1985 agreement betwee Mr. R.P. Goenka and his foreign finan cial and technical collaborators, namel Chemtex and Linde, envisioned a 12. per cent equity participation by the fore ign collaborators in the private promot ers' contributiion.

A clear picture relating to foreign par ticipation would emerge shortly. How ever, bound by the 1985 agreement HPL was under a sort of obligation t invite Chemtex for equity participation Said a highly placed HPL source: "We think Linde cannot be everywhere, with the same group. But with Chemtex, it is different".

Meanwhile, addressing a press conference on Oct. 18, Mr. R.P. Goenka said the Industrial Development Bank of India (IDBI) would come up with a new funding package for the Haldia project. Presently the JJ Mehta committee set up IDBI at the behest of the Union Finance Ministry was busy formulating the package specifics.

"It is my belief the project would be completed much ahead of time. And, no matter who is in power at the Centre or in the State, now or after the election, the Haldia project will be a success", said Mr. Goenka.

Elaborating on the time-table set for the project, he said about two dozen Central and State approvals, now awaited relating to the project, would be athand by March 1990. The project would be put on trial runs within 28 to 30 months from zero date, namely April 1, 1990.

However, not to sound reckless, Haldia Petrochemicals Limited had indicated to IDBI that it would need about 42 months to make the mega project take off.

Mr. Goenka indicated that the debt-equity size was, however, expected to remain the same at 3:1. This would mean an equity base of Rs. 725 crores.

Vitamin C prices revised

The Union Government has, vide its ification of 14 September 1989, ormed the drug industry that hereafter prices of vitamin C (plain) would fixed at a maximum of Rs. 221 a kg., d at Rs. 232 a kg. for vitamin C oated). The new prices are applicable th immediate effect.

The new price formula announced by e Government thus does away with e earlier formula of working out the ice at which vitamin C could be sold. arlier, the price at which each com- any could sell the vitamin C it pro- uced was based on the internal anufacturing cost of the company oncerned.

Thus, Jayant Vitamins (which ccounts for almost two thirds of the roduction of vitamin C in the country) nd the public sector Hindustan Anti- iotics Ltd. were allowed to sell their tamin C (plain) at Rs. 240 a kg., while arabhai could sell at just Rs. 219.50 a g. Likewise, both Jayant Vitamins and AL could sell their vitamin C (coated) Rs. 251.10 a kg. while Sarabhai had sell at around Rs. 230.50 a kg.

It was probably this anomaly which revented the Sarabhai unit from creasing its production of vitamin C. nstead, it preferred to keep the vita- in C it produced for captive consump- on (and sell the same as drug or ormulation which was exempt from the rovisions of the Drug Price Control rder).

The higher price permitted for the itamin C manufactured by Jayant Vit- mins, on the other hand, was one major eason which persuaded the company to xpand its manufacturing facilities in espect of this item.

With the new price control order nnounced by the Government, it is uite likely that the Sarabhai unit will ce quite profitable days ahead, espe- cially in respect of manufacture and sale of vitamin C. On the other hand, Jayant Vitamins is likely to see its profits whittled down by around two-thirds.

Although precise figures are not available (the management of Jayant Vitamins was not available for comment), it is evident that the company stands to see its profits come down at least by Rs. 1.35 crores.

This is because the company sold around 675 tonnes of vitamin C which accounted for a revenue of Rs. 16.46 crores in 1988 (latest figures still not available). This effectively brings the average price realisation for the company to around Rs. 243 for every kilo of vitamin C sold.

With the price now pegged to just around Rs. 221, the company stands to lose around Rs. 20 per kilo (or Rs. 10, if it were to manufacture the coated variety of vitamin C, but which could push the cost of manufacturing this item up even further). What strategy the company will follow to neutralise the effect of this latest Government directive remains to be seen.

ADARSH CHEMICALS' EXPANSION

Adarsh Chemicals and Fertilisers is executing a project for manufactuirng maleic anhydride with the technology provided by Scientific Design Company of the U.S.

Mr. Prakash D. Patel, Chief Executive of the company, has explained that the latest technology will be employed with digital monitoring system and the cost of the project will be relatively lower at Rs. 16.91 crores due to the existing infrastructural facilities. It is scheduled that the scheme should be in operation by early 1991.

World Standard Day observed

The World Standard Day was observed on October 13, to mark the creation of International Organisation for Standardisation (ISO). This is aimed at promoting the concept of standardisation and its utilisation and dedicated to the ideals of industrial discipline through quality assurance management.

The theme of this year's World Standards Day was, "Quality Assurance Management — An International Approach". A seminar on this theme was organised by the Bureau of Indian Standards (Western region) and the Institute of Standards Engineers (Bombay section). Mr. Shekhar Bajaj, Managing Director, Bajaj Electricals Ltd., was the chief guest.

Mr. Bajaj stressed the need for adopting certification in transfer of technology. Mr. C.B. Chandorkar, Deputy Director General pointed out that international standardisation was introduced selectively into the giant wave of development that engulfed the international world. It provided a common denominator for acceptance of products that flow in from regions far removed.

Standardisation was an essential reference frame without which the sheer force of science could be blinding, he stressed. He observed that the fast moving technologies and their concomitant requirements necessitate a fresh orientation in standardisation. Our system has to acquire a new in-built sense of priority and discretion in decision making, resulting in sifting out the redundancies and concentrating on the essential developmental crux, he opined.

He felt that international standardisation has the function of bridging the North-South gap of attitudinal differences. He hoped that the developed nations could be dissuaded from climbing the platforms of inordinately stiff specifications in the name of standards norm, which adversely affected their world nations.

Mr. Murugkar, Director, BIS highlighted how management of quality had assumed great significance, leading to the development of standards on quality systems. The ISO has published a series of five international standards comprising ISO 9000 to 9004 series. These standards are also applicable to service industries such as banking, hospitals, hotels and restaurants. So far, 23 countries have adopted certain versions of the ISO 9000 series. India is the first amongst the developing countries to adopt these standards.

Many meetings were held by BIS with organisations like Directorate General Quality Assurance (DGQA), such as development of organisational structure and its reveiw, matrix of quality functions, infrastructure for training facilities, preparation of quality manuals in industries. A large number of purchasing agencies are not satisfied with the inspection of products alone. They also try to assess the quality assurance systems followed by the industries to gain confidence with regard to consistent quality of the products.

With the introduction of unified quality systems whose transparency can be identified with international standards, the manufacturing industries can now be benefited in line with exporters.

ONGC DEAL WITH TPDC SOON

The Oil and Natural Gas Commission is to shortly sign a contract on production sharing with the Tanzania Petroleum Development Corporation. ONGC sources at New Delhi, said that the contract would be part of a memorandum of understanding to be signed between the Governments of India and Tanzania.

It was being finanlised and was expected to be signed at Darul-Salam. ONGC has, meanwhile, successfully executed a drilling contract in Songo Islands for TPDC, the sources said.

Asked about its Vietnam contract, t sources said it was the first of its ki to be signed by the ONGC. ONGC seismic vessel had returned after co pleting a seismic survey for sev months in the offshore waters of Vie nam. The next step would be drilling f oil and gas, they said.

CAPROLACTAM SUPPLY UNCERTAIN: NFY MANUFACTURERS MAY CUT PRODUCTION

Some of the nylon yarn spinners ar seriously thinking of cutting down th production in view of the uncertaintie prevailing about caprolactam supply The problem has once again cropped u with the Union Finance Ministry insist ing on export linkage for the remainin 50% import requirements of caprolac tam by the nylon filament yarn manu facturers. The ministry is also insistin on raising the export quota for NFY from present 5,000 tonnes to 10,00 tons, according to informed sources The issue had come up for discussio at a meeting convened by DGTD i New Delhi recently, where the represen tatives of department of chemicals an petrochemicals, NFY spinners and indi genous caprolactam producers wer present.

The Government had earlier release 25% of the annual requirement o imported caprolactam, and the finance ministry was insisting for export obli gation on the industry against balance 75% of caprolactam import lincences The ministry, however, waived expor obligation recently and the authorities have already started issuing additiona 25% of the licences for the import o caprolactam without any linkage fo export of NFY.

This had given an impression that th finance ministry would no longer insis on export of NFY in view of the tigh supply position. Besides, it may als result in higher NFY prices adversely affecting the art silk weavers.

NEW REFINERY IN GUJARAT

GNFC may be HPCL partner

Gujarat Narmada Valley Fertiliser Company Ltd. (GNFC) has emerged as the most likely joint sector partner of Hindustan Petroleum Corporation Ltd. (HPCL) for its proposed six-million tonne grassroot refinery in Gujarat.

Three refineries of six million tonnes each are to be set up during the Eighth Plan. Reliance, Larsen and Toubro, Essar, and Oswal are vying with one another to be partners with the refineries for these projects.

Bharat Petroleum Corporation Ltd. (BPCL) is to set up a new refinery in Madhya Pradesh, most probably at Hoshandgabad. Indian Oil Corporation (IOC) is to set up another refinery at Paradip in Orissa.

The Government has indicated that the new HPCL refinery will be located somewhere between Bombay and Baroda. HPCL earlier considered Hazira, which is now out of favour because of congestion, high investment in the area, high cost of land and difficulty in getting environmental clearances.

The coastal area of Saurashtra has also been rejected because it falls within the supply zone of the Koyali refinery in Baroda. Saurashtra region is partly fed from petroleum products imported through Kandla.

In recent discussions on the subject between HPCL and GNFC, Dahej has emerged as one of the probable locations.

Further investigations are necessary to see whether the port facilities at Dahej or Lakhigam can be upgraded so as to accomodate oil tankers requiring 14 to 16 metres draft.

Alternatively, oil can be unloaded by a single buoy mooring and through a submarine pipeline coming to the shore. The exact location can be either near the port or a convenient place inland where rail lines and cheap land can be made available.

The capacity of the refinery will be six million tonnes with hydrocracker facilities, during the first phase.

There is a provision for expanding it to nine to ten million tonnes with a lube oil complex. In its first phase, the refinery will have its own captive power plant of 25-30 mw. It will need 1,800 to 2,000 acres of flat land to cover the present requirements, expansion needs and a township.

The investment in the first phase, including all infrastructure, will be in the range of Rs. 1,800 crores to Rs. 2,000 crores. In a paper on the subject submitted to the Gujarat Government, GNFC says: "If we consider the debt equity ratio of 4:1, the equity will be Rs. 400 crores.

If 50% of the equity is issued to the public in terms of shares, the remaining 50 per cent will have to be generated by the two partners. If the decision is taken not to go to the public, then the entire equity of Rs. 400 crores will have to be brought in by the two partners, each one's share being Rs. 200 crores.

If the decision is to go for public issue, the contribution from the two promotors will be roughly Rs. 100 crores each."

The amount will have to be spent over a period of five years from the zero date. The expenditure during the first two years will be hardly 10 per cent.

The project period including initial Government approval may be around five years, according to the GNFC paper. A task force has been set up to prepare a report to be submitted to site selection committee being joi constituted by HPCL, GNFC and State Government.

TECH PARK TO BE READY I BANGALORE BEFORE 1990

The long proposed "technol park" in Bangalore will be comple before 1990 according to Mr. B.S. P Secretary, Industries and Commer Government of Karnataka.

Land and facilities he said h already been set aside for the purp and companies both from within a outside the state were expected to p ticipate in the venture.

Besides this he said, the Governm also planned to set up tool rooms Mysore and Dharwad for training electronics, at a cost of Rs. 15 cro during the next two years. Mr. Patil w speaking at the inaugural session o seminar on 'Financing electronic ind tries' organised by the Consortium Electronic Industries of Karnataka.

Mr. Patil called upon financial ins tutions to give up conservative attitu in funding electronic industries and more liberal. The high risk associa with electronic sector he said had har ered a more open attitude on the part the financiers towards the industry.

He said that the institutions m present entrepreneurs with a 'prag tic package' of funds. Industries on other hand he said should use the fur more on plant and machinery than c construction works as in many case present.

Mr. Patil said that the electron industry would have to go in for hi volumes of production in order to ma tain cost effectiveness of their produ He felt that there were not enou incentives to the entrepreneurs to go for exports as in countries like So Korea and Taiwan.

Stone laid for JK group plant

The Prime Minister, Mr. Rajiv andhi, laid the foundation stone for the s. 1,340-crore JK Synthetic aromatics d PTA complex at Saleempur on ctober 15th.

Speaking on the occasion, he said the ant, when completed, would benefit ownstream units. There were several mall and medium units proposed or nder excution which could use the enzene, o-xylene, p-xylene, and puri- ed terephthalic acid (PTA) to be pro- uced by the plant.

The Chairman and Managing Direc- r of JK Synthetics, Mr. G.H. Sin- hania, said the plant would be ompleted in 30 months.

It would produce 30,000 tonnes per nnum (tpa) of benzene and o-xylene, 40,000 tpa of p-xylene and two lakh a of PTA. The company would enter e capital market in six months with a debenture issue to raise part of the money required for the project. A separate company would be set up to look after it.

The complex will generate a large demand for direct and indirect employment for people in the vicinity.

It was expected that once it went on stream, several ancillary units would come up to utilise its products.

As part of the complex, there would be a township to accomodate workers, he said.

The Uttar Pradesh Government has allotted 900 acres of land for the project in Aligarh district. It is some 60 km from Mathura from where it will get its raw stocks of naphtha.

This will come from the Indian Oil Corporation refinery via pipelines, construction of which is yet to be undertaken.

Mr. Singhania said tenders for the same would be floated. This component of the project would cost some Rs. 15 crores.

Various companies are being considered for technical collaboration on the different production aspects of the complex. Of the two lakh tpa of PTA to be produced by the plant, the JK group would consume about one lakh tpa. The rest would be sold to nearby plants.

The benzene would be lifted by Straw Products Limited, which has received a letter of intent to set up a linear alkyl benzene plant at Kosi in the Mathura district.

A joint sector project with the Pradeshik Industrial Corporation of UP (PICUP) is likely to come up soon to use the o-xylene produced by the plant.

SPECIAL BRAND RATE DUTY DRAWBACK:

Cut-off limit lowered

The Union Government has liberalised the eligibility criteria for special brand rate of duty drawback by reducing the minimum differential from the existing 25% to 20%.

Exporters can now seek special brand rate facility where the all industry rate for the product is less than 80% of the actual duties suffered by the applicants' products, according to an official release on October 16.

The Government had received representations to the effect that the minimum differential of 25% for elegibility of special brand rate of drawback should be reduced as the exporters were often affected owing to the existing high cut-off limit.

The liberalisation in the eligibility criteria to 20%, the release said, should help exporters in availing of the drawback facility in general and in particular those who are exporting products like electronic goods, drugs, dyes and their intermediates and certain engineering items.

Duty drawback rates for various export products are announced each year after assessing the average incidence of customs and central excise duties suffered on different inputs that go into the manufacture of those products.

The all-industry rate of drawback for a product can be claimed by any exporter of that item. To ensure that the exporters do not suffer adversely, they have been provided the facility of claiming special brand rate, applicable on individual basis, only if the all-industry rate of drawback announced is less than 75% of the actual duty suffered.

ASTRA BID TO EXPAND OPER TIONS

Dr. Hakan Mogren, President Group Chief Executive Officer of Astra, Sweden will be visiting In from October 22 to 25.

During his visit, Dr. Mogren v oversee the operations, assess the di scenario, and explore the possibilities expanding Astra's activities in Ind AB Astra, is a reputed research-orien pharmaceutical company with ope tions throughout the world.

It co-promoted Astra-IDL in 19 along with IDL Chemicals Ltd. Ast IDL is engaged in the manufacture ethical drugs and pharmaceutic including highly acclaimed drugs li betaloc, penglobe, sensorcains, xylo aine and bricanyl-all based on origi research.

Molasses, alcohol: New TN policy soon

Tamil Nadu Government is shortly ning out with a new policy on pro- ction and utilisation of molasses and ohol and their allotment for industrial . Broad features of the policy are: marking substantial portion of the lasses and alcohol for the industries, rmitting new distilleries only in the -operative sector, allowing the expan- n of some of the distilleries and couraging the growth of alcohol- sed industries.

An official order is to be issued ortly to give effect to the policy anges. In formulating the new policy, e Government has taken into account e surplus in molasses supply owing to pansion of the sugar industry in the ate and the focus on alcohol-based dustries and down stream products.

The Chemical Industries Association, hich has played a major role in revis- g the policy, is happy with the pro- sed measures. One major decision ken by the Government is to allott 5% of the molasses and alcohol pro- uced in the State only for industrial e. It has also decided that henceforth atters relating to alcohol and alcohol- ased industries will be handled directly the Industries Department and not by e Excise Department, which is to nforce only prohibition and excise les.

Further, new distilleries will up come nly in the co-operative sector. Already vo units have been sanctioned in the ctor. Co-operative sugar mills can go for creating distillation capacity to ake use of their surplus molasses. At e same time, the existing distilleries ill be allowed expansion for captive nsumption to manufacture down ream products. Now there are nine dis- lleries, all in the private sector, with capacity to produce 985 lakh litres of lcohol a year.

As the molasses supply is expected exceed seven lakh tonnes by 1991-92, there is a scope for creating an additional distillation capacity of 2.75 lakh litres. Similarly, the present consumption of alcohol by the industry, placed around 380 lakh litres, (220 lakh litres by potable users) can go up to 750 lakh litres in the next two years. In view of this, the State Government is for encouraging more alcohol-based industries and allowing the expansion of existing chemical units.

The improved supply of alcohol will give a fillip to the manufacture of various chemicals like poly vinyl chloride, vinyl acetate monomer, acetic acid, butanol and butyl acetate etc. Besides, it will replace plastics and resin materials with alcohol. While coming out with a liberal policy, the State Government has taken a serious view of the diversion of alcohol and molasses by a large number of units for non-industrial purposes like sale by illicit liquor makers.

This has not only affected the flow of alcohol to genuine units, but also discouraged the growth of new industries. Further, it is upset over the tendency on the part of the units to get larger alcohol allotment but fail to utilise the supply. This has also affected the distribution pattern. In order to prevent the misuse of rectified spirit the Government is considering a suggestion to insist on the use of denatured alcohol wherever possible.

BHEL BAGS RS. 20 CR. ORDER FOR NARORA N-PLANT

The public sector Bharat Heavy Electricals Ltd. in Tiruchirapalli has bagged a Rs. 20-crore order from Nuclear Power Corporation for supply of steam generators for the Narora nuclear plant, according to a BHEL press release. The release said recently that BHEL would supply four nuclear steam generators for the 235-mw unit of the plant under the order.

Aluminium production expected to doubl

The production of aluminium is expected to go up to 5,50,000 tonnes by 1994-95 from 2,75,000 tonnes in 1987-88 with the materialisation of additional capacities that have been planned by the various primary procurers, according to Mr. Navin H. Shah, President, All India Non-Ferrous Metal Industries Association.

Delivering the presidential address at the 43rd annual general meeting of the association held at Bombay recently, Mr. Shah said that with expansion of the capacities for the manufacture of semi-fabricated products also like rolled products extrusions, foils etc., the country is poised to explore new applications of aluminium. There were about 3,000 applications of aluminium in the international markets whereas in India this versatile metal is being used for only 200 applications, he added.

The per capita consumption here being only 0.4 kg, there is potential for better economic utilisation of the metal, according to him. Mr. Shah urged the Government to levy excise duty on aluminium on "specific basis" per tonne. He mooted that exercise duty be fixed at Rs. 5,250 per tonne (basic) along with a five per cent special duty which would amount to Rs. 5,512.50 per tonne.

He pointed out that since production is expected to be doubled by 1994-95, the Government would not face loss of revenue. The pre-Budget level of excise duty realisation from aluminium would be assured if a specific rate of excise duty at Rs. 4,000 per tonne from the next year is fixed. Mr. Shah said that there is need to boost exports of aluminium. He called for adequate and timely fixation of duty draw-back rates so that manufacturers/exporters did not incur losses in the reimbursement of excise duties paid by them on inputs for their export production.

The Government should include all categories of aluminium semi-finish and finished products under IPRS enable manufacturers/exporters to com pete effectively in the international ma kets.

He also favoured timely availabili of raw material adding that the Gov ernment should re-introduce the schem of replenishment of raw materials fo export production based on the previ ous month's actual exports as was pre valent during 1976-77. He pointed ou that it would be more beneficial t encourage exports of value-added pro ducts of aluminium instead of export ing virgin metal.

Mr. Shah urged the Government t release the required foreign exchange t MMTC to enable it to bridge the gap between demand and supply of copper He also asked the Maharashtra Gov ernment to withdraw the hike in octro on non-ferrous metals from 1.5 per cen to 2.5 per cent ad valorem.

SCIENCE CONGRESS

The 77th session of the Indian Science Congress will be held in Cochin from February 4 to 9 next.

This was decided by the executive committee of the Indian Science Con gress Association at a meeting in New Delhi, on October 14. The venue of the congress will be the Cochin University of Science and Technology, according to an association press release.

CEPHAM PHARMA

Cepham Pharmaceuticals has com out with encouraging results for the five months period ended August 1989. I has achieved a turnover of Rs. 15 lakhs against last year's total turnove of Rs. 184 lakhs for the nine month period. The company has announced a interim dividend of 10% for the curren year, which is a maiden dividend fron the company.

Chemicals export likely to cross Rs. 2000 crore

Exports of chemicals and allied products by exporter-members of the Chemicals and Allied Products Export Promotion Council (CAPEXIL) may cross the Rs. 2000-crore mark this fiscal year signifying a mercurial jump of Rs. 1,300 crores over the council's previous year's show of Rs. 744 crores. This unprecedented projected growth is largely attributed to the tagging of exporters' of bulk minerals and ores including salt, coal and aluminium metal.

The Government has been for quite sometime toying with idea of tagging the bulk exporters like Kudremukh Iron Ore Ltd., Minerals and Metals Trading Corporation and several other medium scale exporters numbering around 25 to one or the other export promotion council. So long, these exporters were outside the purview of any export promotion council hence their export policy, strategy or action plan could not be discussed in any broader forums like export promotion council. The Government has ultimately decided to bring bulk materials and ores under the umbrella of CAPEXIL. The gazette notification has already been issued to this effect.

According to the tentative estimate of CAPEXIL for the current financial year, based on the performance of the bulk minerals and ores exporters in 1988-89 and the information furnished by these exporters to the council, chemicals and allied products exports this year would be around Rs. 2,050 crores.

Of this, the bulk minerals and ores would account for Rs. 1,058 crores. The second important item under minerals and ore panel is processed minerals which would account for Rs. 350 crores against Rs. 276 crores in 1987-88. There will be an increase in exports of granites, stones etc, from Rs. 127 crores to Rs. 138 crores this year.

The export targets for bulk minerals and ores indicate that iron ore exports would be around Rs. 750 crores this year against Rs. 670 crores in 1988-89. In the first four months of this financial year, exports of iron ore stood at Rs. 243 crores an increase of Rs. 43 crores from Rs. 200 crores in 1988-89.

In 1988-89 Japan was the largest importer of Indian iron ore. It imported 21.72 million tonnes of iron ore from India valued at Rs. 425.5 crores. Japan was followed by Romania's 2.1 million tonnes valued at Rs. 29.79 crores. Other countries which imported Indian iron ore in 1988-89 included among others, West Germany (Rs. 12.18 crores), East Germany (Rs. 7.37 crores), North Korea (Rs. 14.01 crores), South Korea (Rs. 74.31 crores), Hungary (Rs. 20.67 crores), Pakistan (Rs. 7.40 crores), Turkey (Rs. 13.24 crores), and Yugoslavia (Rs. 6.49 crores).

The chrome ore exports is expected to register a two-fold increase form Rs. 62.71 crores in 1988-89 to Rs. 113.5 crores this year. Chrome exports in first four months was Rs. 21.89 crores against Rs. 18.21 crores during the comparable period in the previous year. India exported chrome ore to five countries last year. Among the importers China topped the list with Rs. 29.24 crores followed by Japan (Rs. 18.58 crores). Others included the Phillippines (Rs. 11.54 crores), Sweden (Rs. 2.64 crores) and Taiwan (Rs. 71 lakhs).

Two-fold rise is expected in case of exports of manganese ore also. Exports of this item are estimated at Rs. 26 crores this year against Rs. 13 crores. In the first four months of this year, exports of manganese ore stood at Rs. 8.68 crores against Rs. 2.68 crores. Copper exports, however, are likely to be around the same level of Rs. 10 crores but coal exports are likely to be up at Rs. 25 crores against Rs. 16.5 crores in 1987-88.

The non-mineral sector is estimated to close the current financial year with Rs. 505 crores against Rs. 376 crores in 1988-89. In the first four months of the year, the non-mineral sector exports stood at Rs. 132.5 crores against previous year's Rs. 111 crores. The productwise exports target for the current financial year shows that there would be a substantial rise in exports of cements, clinkers, asbestos, cement products. The projected target is Rs. 42 crores against Rs. 11.6 crores exported in 1988-89, although the first four months' performance was at last year's level of over Rs. 2 crores.

The footwear division, however, expects a two-fold increase from Rs. 6.8 crores to Rs. 12 crores. Automobile tyres and tubes' exports stood at Rs. 100 crores compared with Rs. 76.3 crores in 1988-89. Similarly, paints and varnishes exports are likely to be higher at Rs. 85 crores against Rs. 71.6 crores in 1988-89. In fact,, in the first four months period of this year, exports were up at Rs. 26.6 crores from Rs. 22.3 crores during the comparable period last year.

OCTL JOINS API FAMILY

Oil Country Tubular Limited has been authorised to use API monogram on its products viz., drill pipes, production tubing and casing pipes. API has conferred this distinction on OCTL as a processor of casing and tuning-plain end-threaded and coupled-threader and processor of drill pipes.

American Petroleum Institute (API) is the supreme authority to check the quality standards of oil country tubular goods. After conducting a stringent survey and audit of OCTL's manufacturing facilities, API has granted this licence to OCTL. OCTL is one of the few companies in the world to have this rare distinction and the first in India.

KAPL to diversify into biotechnology

Karnataka Antibiotics and Pharmaceuticals Ltd. (KAPL), the manufacturer of life-saving drugs, is diversifying into the field of biotechnology.

The company Chairman, Mr. H. Nagaraja Setty, told newsmen that the company has already identified products such as animal birth control injection and various immuno diagnostic kits (such as AIDS, hepatitis, strep-A, syphillis, malaria probe etc.). The immuno diagnostic kits have also been identified, initially for importing and marketing and later on for indigeneous manufacturing.

The company has also signed a memorandum of understanding with National Institute of Immunology, New Delhi, for transfer of technology for manufacture of animal birth control injection.

As a diversification towards 'trading activities', one of the vaccines to be manufactured by a Central public sector undertaking has already been identified to be taken up for marketing by KAPL on an exclusive and all-India basis.

Mr. Setty said the scope for expanding the current business activities of the company on the basis of the antibiotics alone, without the new generation antibiotics, will be rather limited. It is expected that most of the present generation of antibiotics might be replaced either with new generation of antibiotics or with totally substituting products by the dawn of the 21st century.

For the 15-month period ended March 1989, the net profit rose to Rs. 24 lakhs from Rs. 11 lakhs which represented an increase of 74%, according to Mr. Setty.

The gross profit of the company was Rs. 1.94 crores as compared to Rs. 98 lakhs during 1987. After providing interest at Rs. 1.39 crores, depreciation at Rs. 28 lakhs, taxation of Rs. 4 lakhs the net profit remained at Rs. 24 lakhs.

The value of production, increased from Rs. 9.88 crores in 1987 to Rs. 20.32 crores in 1988-89 while sales during the period were Rs. 18 crores as compared to Rs. 10.14 crores during the previous year. The company during the year declared a maiden dividend of 10 per cent.

EXPERTS FEAR "ENERGY GLUT"

Experts in the US are now talking of an "energy glut" in the world. Gone are the fears of a world shortage early in the 21st century.

Experts in published papers and articles, now estimate "proved recoverable" oil reserves at 890 billion barrels up 30% from earlier estimates.

The experts say Iraq has almost as much oil as Saudi Arabia. Iraq has already added 50 billion barrels to its earlier estimate. Iran says it too has a lot more oil than previously known and has increased its estimates by 48 billion barrels. The United Arab Emirates has added 66 billion barrels.

World natural gas reserves are up too. The Soviet reserves are now estimated at 1.5 million billion cubic feet, followed by Iran with about one-third as much. Others are also increasing their estimates.

Coal estimates have gone up by 80% in the last three years. The world energy conference says that world reserves of coal are now put at 1,100 billion tonnes.

It is not clear whether surplus of energy means cheaper energy. In the early eighties, when oil was selling at $ 40 a barrel, some analysts said it would reach $ 100 a barrel by the end of the century.

A rapid wrap-up of what's new in Operations, Processes and Products

Membrane Separation Processes (MSP)

This subject is under intense investigations world over and in this coumn we have given adequate coverage. In a recent issue of the *Journal of Membrane Science* (1989, **44**, No. 2+3, June 15, p. 265-272) Slater has discussed the topic of instructions in MSP at under-graduate as well as post-graduate levels (including instructions in laboratory). There is a need for Chem. Eng. Depts. to innovate in this area in all respects. There is no text book in this subject; focus on scientific aspects and process engineering is important. In many schools in USA the courses on MSP have received high ratings.

Lee **et al.** (*ibid*, p. 161-183) have discussed some pertinent aspects of pervaportion (PV) for removal of ethanol and chloroform from aqueous solutions. Several apolar polymeric materials exhibit higher separation coefficients than that expected from V-L equilibrium for chloroform and ethanol.

Extraction of copper with liquid membranes and supported hollow fiber based membranes continues to occupy an important position in research work. The use of LIX 65 for extraction of Cu has been covered by Goto **et al.** (*J. Chem. Eng. Japan*, 1989, **22**, 79-99).

Sirkar and co-workers continue to introduce novel ideas in MSP. Conventional membrane permeation of gases adopt a one-step process between the feed and the product on two sides of a membrane. However, by applying the overall driving force change through a two-step process using two membranes in one device, it should be possible to achieve a much higher enrichment without any extra energy consumption. Experimental work with O_2-N_2 (air) and CO_2-N_2 brings out the efficacy of the internally staged permeator. A co-current flow is superior to a counter-current flow pattern (Sidboum, Majumdar and Sirkar, *A.I.Ch.E. Jl.*, 1989, **35**, 764).

Cussler and co-workers also continue to make strides in MSP. They have now shown that modules containing from 120 to 27,000 parallel hollow fibers 100 micron in diameter can separate mixtures by reversed phase chromatography. The mixtures separated include aqueous solutions of ketones using alkanes as the stationary phase (SP) and aqueous solutions of the proteins and myglobin and cytochrome-C using an octane solution of reversed micelles as the SP. Hollow fibers based modules are superior to columns of spheres of equivalent surface areas per volume. Scale-up with hollow fibres should be more easily possible. (*A.I.Ch.E. Jl.* 1989, **35**, 814).

Cooney and co-workers continue to work im this area and their recent paper on the use of hollow fibre contactor as an absorber brings out the efficacy. Experiments were done for absorption of SO_2. (*Chem. Eng. Commun.* 1989, **79**, 153).

A recent report by J. Haggin (*Chem. Engg. News* 1989, May 8, p. 29) refers to a talk by J.M.S. Henis (of Monsanto and co-developer of Prism separator) and the bright future of MSP. Henis has opined that thermodynamics is useful in making membranes but the forming of a membrane is really a time-dependent kinetic process. Composite membrane will dominate the future of membrane technology. The newest composites described by Henis are SM (Surface Modified) for Biological application. One surface modification is concerned with polymer surfactants. Simple gas separators may find application in home refrigerators!

The production of 99.9% nitrogen from air has attracted a lot of attention and Union Carbide and Generon Systems (a Dow Company) have claimed 22% recovery efficiency-nitrogen yield divided by air input at 25°C and 135 psi. By 1995, it is expected that upto 30% of the cryogenic market may be captured by membrane separations. (*Chem. Week.*, 1989, June 14, p. 6).

Ishikawa **et al.** have separated water-ethanol by permeation through a zeolite membrane, which is water preferential. A separation factor greater than 200 is realised. (*J. Chem. Soc. Chem. Commun.*, 1989, p. 764).

Noble **et al.** have given an exhaustive account of facilitated transport membrane systems, which include liquid membranes (LM) immobilized liquid membranes (ILM) and ion exchange membrane supports (IEM). Carrier-mediated transport is achieved in several ways: reversible complexing agent in the LM phase; using either counter-coupled transport; co-coupled transport. In the case of ILM a new emerging field is the use of high tem-

perature inorganic support to immobilise molten salts for recovering e.g. NH_3 from syn gas loop at high temperatures. Fixed-site carrier membranes have the carrier covalently bonded to the membrane phase. Thus the reversible chemical reaction between the solute and carrier is envisioned as occurring continuously throughout the thickness of the membrane. Here the solute "jumps" between carrier sites. In the recent past a highly selective layer on a relatively high permeability support has been deployed and this is akin to asymmetric membranes. (*Chem. Eng. Prog.*, 1989, March, p. 58-70).

Zeolite for fine chemicals

The role of zeolites in carrying out a variety of conversions, including multistep processes, has been brought out in this column several times. Important transformations that can be conducted with different zeolites include nucleophilic and electrophilic substitution reactions, isomerization and rearrangement reactions, oxidation and condensation reactions, etc. In the reaction of methanol with ammonia, zeolites allow trimethylamine to be eliminated or formed exclusively. Mordenite displays high selectivity for dimethylamine which surpass the equilibrium level. In esterification reactions zeolites can act as water adsorbents. The combined prowess of zeolite as selective adsorbents and catalysts has been exploited.

Acylation of phenol with silicalite catalyst at 300°C gives predominantely ortho acetylated product and a considerable amount of phenyl acetate is formed.

The liquid phase chlorination of chlorobenzene, toluene etc., in the presence of zeiolites, allows much higher level of the *para* product.

Zeolites can be used to make MTBE but they are unable to match the effectiveness of cationic ion exchange resins. Acetaldehyde dimethyl acetal can be converted to methyl vinyl ether with 99% selectivity at 91% conversion with Na-mordenite or a Na-ZSM-5.

The addition of amines to epoxides provides a fascinating example as the ratio of the isomers can be manipulated over a wide range.

Styrene oxide can be converted to phenyl acetaldehyde with Ti-zeolites in acetone at 30-100°C or on pentasil in the gas phase. Limonene-1,2 epoxide has been converted to carrenone with Ca-A-zeolite at 150-210°C.

Aldol condensation can be conducted with zeolites. ß-Substituted pyridines can be synthesised from acrolein and an alkanal and ammonia. Cyclocondensation of aniline and ethylene glycol at 300°C with aluminozeoli gives indole in 54% yield.

Oxidation with H_2O_2 using Ti-Silicalite is gainin importance e.g. phenol to hydroquinone. The conversio of cyclohexanone with NH_3 and H_2O_2 to cyclohexanon oxime has been reported. Further oxidation reactions wit "Ship-in-the bottle" complexes have been reported.

Dehydroisomerization of alpha-limonene to p-cymen provides an interesting example. Alpha-Pinene has bee hydrated at 50-70°C with water with zeolite GO-82 t give borneol. [W.F. Hoelderich, in P.A. Jacobs and R.A Van Santen (Editors) Zeolites Facts, Figures, Future 1989, *Elsevier Sci.*, p. 69-93].

Fatty acid chlorides from fatty acids and BzCl

It has been claimed by a Japanese Company (Nikkei Kako) that fatty acids and BzCl react at higher temperature and diphenyl ether can be used as a solvent; BzOH is distilled out 5 to 6mm Hg pressure. (*Chem. Abstr.* 1989, **111**, 23096).

A new insulating material

Battelle with Thermalon Ind. have come out with a new insulating material based on polypropylene or polyethylene terephthalate (PET). In this process a 0.5 ml thick film is slit, put under tension to form a honeycomb structure and then thermally set. Other polymers are also being considered. (*Chem. Week* 1989, July 19, p. 38).

Methylmethyacrylate (MMA)

Mitsubishi Gas Chem. have come out with a new process based on acetone and HCN which avoids production of ammonium sulfate. Here the acetone cyanohydrin is hydrated to forus alpha-hydroxy isobutyramide which then undergoes ester exchange with methyl formate to give methyl alpha-hydroxy isobutyrate (HBM) and formamide. HBM is dehydrated to give MMA and formamide on dehydration give HCN which is used to make cyanohydrin. (*Chem. Week* 1989, July 26, p. 38).

Condensation of phenol with acetaldehyde/formaldehyde to give *p*-substituted derivatives

Mitsui Toastu Chem. have claimed that the use of powdered H^+ type Y zeolite at 150°C allows phenol and acetaldehyde/paraldehyde to give 86% *p*-derivative (i.e. 4-hydroxy-alpha-methyl benzyl alcohol) at 60% conversion of the aldehyde. Similarly the use of trioxane at 160°C allows 88% selectivity to the para-hydroxy methyl

phenol at 65% conversion of trioxane. (*Chem. Abstr.* 1989, **111**, 23207 and 23208).

Air oxidation of toluene and substituted toluenes with PTC

Sasson and co-workers, who have made valuable contributions in phase transfer catalysis (PTC), have now claimed in two European Patents that PTC can be useful in oxidizing toluenes with oxygen. Thus cobalt chloride dodecyldimethyl ammonium bromide allowed oxidation at 135-160°C and 12-15 atm. with air of toluene and even of 4-chlorotoluene. (E.P. 300,921 and 300922; *Chem. Abstr.* 1989, **111**, 23218 and 232219).

Oxalic acid (OA) with NO_2

Tihai and Shengyu (from China) have shown that the well known method of making OA via oxidation of carbohydrates (sugar, glucose, etc.) with nitric acid can be modified to use NO_2 which is passed directly into the aqueous solutions of carbohydrates. Thus hydrolysed starch, containing 20% (by wt.) glucose, 30-40% H_2SO_4, V_2O_5 0.0001% and 0.002% ferric sulphate is oxidised with 10-40% NO_2, 2-3% O_2 at 55°C. (*Chem. Ind.* 1989, 3rd July, p. 423).

Flue gas desulphurization (FGD) (SO_x and NO_x removal)

In U.K. the CEGB's DRAX coal-fired station in Yorkshire will adopt the Babcock FGD process and this will take care of 90% of SO_2 emissions and will consume 500,000 tpa of limestone resulting in production of 1 mtpa of gypsum. The contract is worth Pounds Sterling 500 m; the power plant has 6 x 660 MV boilers consuming 37,000 tpd of coal. The absorber will be rubber lined steel; all the ducting will be nickel alloy lined with an organic resin. The coal contains high chloride at 0.4% and hence a prescrubber is to be installed to remove chlorine. (*Chemical Engineer*,UK, 1989, No. 459, April p. 10).

Argonne Lab. in USA has developed a new absorbent based on hexamethylenetetramine (based on reaction between ammonia and HCHO) Fe(II) chelate which also takes care of NO_x and is resistant to O_2 in the flue gas. The presence of SO_2 seems to enhance the removal of. NO_x. (*Ibid*, p. 30).

New develoments in Photochemical Syntheses (PS).

Demuth and Mihail have surveyed recent work in PS and this includes (2+2) cyclo-additions -C-C bond and oxetane formation, Olefin to -arene meta-cyclo additions, etc. The majority of these light-induced transformations proceed at high levels of chemo- and stereo control upon proper choice of the wavelength of excitation. Waste problems related to work-up in PS are uncommon. (*Synthesis*, 1989, March, 145-162).

Gas Absorption

Separation of Olefins

The well known absorbent for CO - $CuAlCl_4$ dissolved in touene/aromatic solvents is modified with aniline/t-oluidine for realizing selective absorption of olefins. (*Chem. Abstr.* 1989, **iii**, 7981).

Enhancement of rates of absorption of O_2 in aerobic fermenters

Rols and Goma hve shown that O_2 supply can be improved by using an emulsified organic liquid, in biofield the world "vector" has been used for the emulsified liquid phase to designate its use as a carrier. [*Biotechnol. Adv.* 1989, **7**, (1)].

Simultaneous absorption of CO_2 and H_2S

This subject continues to attract attention and several papers on this subject and absorption of H_2S and CO_2 individually in soiutions of different alkanolamines have appeared. Pitsinrgos and Lygeros have a paper on prediction of H_2S -- MEA equilibria. (*Hydrocarbon Processing* 1989, **68**. No. 4, p. 43). A computer programme has been given.

A recent issue of *Gas Purification* has a detailed paper by Blauholff **et al.**, from The Netherlands. Problems associated with selectivity are discussed at length.

The roots of innovation

F.J. Karol, Sr. Corporate Fellow in Union Carbide (UCL), USA, winner of The Perkin Medal of the American Section of the SCI, has discussed factors, which support and nurture innovation. Team work as important in large size projects. He has referred to the role of catalysis and how gifted individual scientists can achieve a lot. Polyethylene today is most widely used chemical in the world and the recent work of UCL, where Karol was associated, on LLDPE is discussed. "Outside pressure, and a wholesome fear of competition, are two factors that propel industry. However, there is another factor associated with "excitement" and "fun" that matters a lot. (*Chem. Ind.* 1989, 17 July, p. 454).

Synthesis of the very large pore molecular sieve MCM-9 in a two-phase system

Derouane **et al.,** have synthesised MCM-9, which is the silicon-containing analogue of the recently identified 18-membered ring aluminophosphate molecular sieve VPI-5, in a two-phase (aqueous-immiscible org. liquid) media. Si incorporation into the aluminophosphate framework is achieved by phase transfer and hydrolysis of a silicon containing reagent supplied from the immiscible organic liquid phase. (*Applied Catalysis* 1989, **51,** L13-L20).

Catalytic activity of cationic ion exchange resins (IER)

Gimenez and Cervera-March have made a useful study of the fall in the catalytic activity of the acidic IER, based on sulphonated styrene-divinyl benzene, through the vapour phase esteriication of acetic acid with ethanol. The activity of fresh resins decreases during the initial period. Once the resins have been used, and after a long stoppage, the activity decreases. For instance, after a 2 month stoppage, the activity decreased by 30%. A number of commercial IER, like Amberlyst 15, Levatit SPC-118 and 108 and Imac C-102 (Akzo) were used. (*Applied Catalysis* 1989, **48, 307).**

Two-phase reduction of unsaturated aldehydes to unsaturated alcohols

Joo and Benyei have shown that Ru complex catalysed hydrogen transfer from aqueous HCOONa solution can achieve this selective reduction at 30-80°C in a facile manner. Ru(II) with sulphonated triphenyl phosphine catalyst appears to be good and selectivity is very high. Cinnamaldehyde, crotonaldehyde, 1-cironellal and citral were studied. (*J. Organometallic Chem.*, 1989, **363,** C19-C21).

Colloid Science (CS) -- The midwife of invention

Prof. Birchall has discussed the important role of colloid science which is the chemistry of everyday life. CS is important in cement, bricks, pottery, porcelain, glass, enamels, oils, grease, soaps, candles, glue, starch, adhesives, paint, varnishes, lacquers, leather, paper, textiles, filaments, casts, pencils and crayons, inks, roads, foundry cokes, asphalt, photography, ore flotation, comets, etc. Birchall has termed CS the 'widwife of invention' because the intellectual appoach peculiar to CS can generate such understanding that the delivery of a new product to the market is facilitated, even if CS (like the midwife) was not involved in its conception. Thus in formulation of drugs, agrochemicals, emulsions, etc. the role of CS is clearly discernible. The role of CS in fire extingushing gents is well brought out the use of certain inorganic compounds can generate aerosols in flames ($KHCO_3$ in molten urea). Strong cement product can be made through better understanding of the CS and the use of polyvinylalcohol is very useful. The production of advanced ceramics requires a good undersanding of CS. (*Chem. Ind.*, 1983, 3 July, 403).

Catalyst '89

There is an exhaustive report on this subject in a recent issue of *Chem. Week* (USA) (1989, 28 June, p. 24-40). The world wide market is about $3 to 4 billion and USA alone accounts for $1.7 billion. The automative market is expected to increase from $490 million in 1988 to $570 million in 1993. The stationary emissions controls is a new opportunity. Diesel traps to reduce uncombusted particulates are also under consideration and it seems that ceramic filters can trap them and the use of Pt or base metals on the catalytic surface will allow periodic combustion.

Catalyst supports for making polyethylenes are witnessing good growth. In the case of Raney Ni catalyst, Grace has been able to bring out a pelleted catalyst for a fixed bed operation. Catalysts for EDC and VC are also witnessing growth. New catalysts for styrene from ethyl benzene have appeared which allow higher conversion per pass at lower specific steam consumption.

Improvements in H.T. shift catalysts, with incorporation of Cu, have been reported and these prevent parasite reactions resulting in the formation of hydrocarbons. Improvements in V_2O_5 based sulphuric acid catalysts in the form of Raschig rings and rib-rings (Ring shaped with ribbed sides) have also been reported. A new market for reforming catalyst for methane is for making CO + H_2 for the direct reduction of iron oxide.

More active and longer life catalysts for methanol have been introduced.

There are reasonable chances for the direct conversion of propane to acrylonitrile to be successful.

MELS (Pillared Clays: Molecular Engineered Layered Structures) are likely to become important and may show some interesting features compared to zeolites.

The use of mass absorbents -- reactive filters that remove impurities such as AsH_3, COS, RSH, Pb, Hg etc. from C_4/C_4 streams from FCC units is growing and Procatalyse of France has been introducing such materials. Hydrocracking to maximise diesel and jet fuel continues to be important.

Seminar on water management in the chemical industry

The Institution of Engineers (India) is organising an All India Seminar on "Water Management in Chemical Industry" at Ahmedabad on 2nd December 1989. The topics to be covered include:

1. Industrial effluent recycling.
2. Recycling of cooling tower and boiler feed water blow down.
3. Sewerage recycling in a large city.
4. Water management in industrial estates — a case study.
5. Converting sea water into potable water — a case study.
6. Water management in drought affected region — a case study.
7. Water management philosophy in an integrated chemical complex.
8. Water management in petrochemical complex.
9. Water management in fertiliser plants.
10. Water management in rayon industry.

The registration fees for delegates is Rs. 250. This fees is payable by demand draft in favour of "The Convenor, Seminar, WMCI, The Institution of Engineers (India), Ahmedabad so as to reach by 20th November 1989.

For further details contact: Shri A.K.A. Rathi, FIE, Convenor, The Institution of Engineers (India), Bhaikaka Bhavan, Ellis Bridge, Ahmedabad 380 006.

FIRST INTERNATIONAL SYMPOSIUM ON THE BIOLOGICAL PROCESSING OF COAL

The U.S. Department of Energy and the Electric Power Research Institute are co-sponsoring an international symposium on the biological processing coal, to be held May 1-3, 1990, Orlando, Florida.

This symposium is intended to fo increased activity in this emerging ar as well as to identify pertinent new b technologies, and to promote ra technology development and impleme tation.

If you are interested in presenting paper, please submit a detailed syno sis (200-400 words) as soon as poss ble. The synopsis must include:

Name, Title
Business Name & Address
Business Phone Number

Summarised content of the paper

Based on the evaluation of your syn opsis, you will be notified of the accep tance of your paper by October 3(1989.

If selected, a final "camera-ready" abstract will be required before th symposium, and a complete manuscrip for the Proceedings will be require after the symposium.

Please suggest a classification fo your paper from the list of topics below

* Coal structure and bioreactivity
* Coal analysis
* Coal biosolubilisation, biogasificatio and biobeneficiation (including deashing, desulphurisation, denitrifi cation, and bioassisted flotation).
* Bioconversion of coal-derived sub stances (including bioconversion o synthesis gas and coal combustion gases, and bioprocessing of tars and sludges).

Please address synopsis and other inquiries to:
Dr. Kee Rhee,
U.S. Department of Energy,
Pitsburgh Energy Technology Center
P.O. Box 10940, MS 141-L,
Pittsburgh, PA 15236-0940. USA.
Telephone: 412/892-5193.

RPS changes hit GNFC profits

Although Gujarat Narmada Valley rtilisers Ltd. (GNFC) has performed ll on production and marketing nts, matching financial results for the month accounting year ended march 89 have not come forth due to the anges in the retention price scheme PS) of the Union Government.

But for the changes in RPS, the com-ny would have made a gross profit of s. 63 crores and a net profit of Rs. 31 ores (pre-tax) for nine months period hich on annualised basis would have en Rs. 84 crores and Rs. 41 crores to present percentage increase of eight r cent and 45 per cent respectively mpared to the last year.

However, due to adverse changes in PS, the company has been able to ake a gross profit of Rs. 20.07 crores fore providing for depreciation and ter meeting with all costs including terest of Rs. 34.85 crores and recov-y of Rs. 10 crores being depreciation nount for the period from April 1988 June 1988 which was paid to the mpany in 1987-88 under pre-revised PS.

There being a wide gap between the preciation provided by the Compa-es Act and the depreciation available it under revised RPS, the company as not in a position to declare any di-dend.

However, hoping for positive out-me of representation made by the mpany in respect of RPS, the Com-ny Law Board was approached by NFC to permit to provide depreciation lower rate and declare dividend which as been permitted.

Out of the amount of Rs. 27.27 crores vailable for depreciation, a dividend of) per cent has been recommended for e period which on annualised basis orks out to 13.33 per cent against 18% aid last year. Net profit for the year is s. 6.63 crores after providing Rs. 12.04 crores for depreciation and Rs. 1.40 crores for taxation.

Corresponding figures of net profit for the previous year was Rs. 23.77 crores after providing Rs. 49.68 crores for depreciation and Rs. 4.50 crores for taxation.

GNFC's sales of 5,94,524 tonnes of urea registered an increase of 60% on annualised basis. Similarly GNFC achieved a sales turnover of Rs. 238.79 crores for the period registering an increase of 13.65 per cent on annualised basis. The ammonia plant produced 3,61,112 tonnes of ammonia, the urea plant 5,43,154 tonnes and methanol plant 21,224 tonnes.

The ammonia plant's capacity utilisation rose from 92.75% to 108.05%. The urea plant's capacity utilisation also increased from 105.02% to 121.88%, and the methanol plant from 101.02% to 141.08%. GNFC has already completed projects of over Rs. 170 crores. During 1989-90 alone, three projects were commissioned to produce formic acid 5,000 TPA, printed circuit boards 44,500 sq.mtrs. and 25 mw Phase II captive power plant.

The Rs. 237 crore nitrophosphate project is going on stream during 1989-90 and the Rs. 75 crore methanol expansion project is slated for the next year. The Rs. 250 crore TV glass shell project and phosphoric acid project as joint ventures in UAE are under implementation.

HAZIRA FERTILISER PLANT MAKES RS. 100-CRORE PROFIT

The Rs. 885-crore gas-based Hazira fertiliser plant has made a net profit of Rs. 100 crores for the period 1988-89, said Dr. K.K.S. Chauhan, Managing Director, Krishak Bharati Co-operative Ltd. (KRIBHCO), said at Bangalore on October 12.

Inaugurating the new premises of the state unit of the Kribhco, he said the plant produced around 4,400 tonnes of urea every year. He indicated that the Kribhco was interested in adopting one cluster village in the Bangalore district for sustained development work.

Mr. B.S. Vishwanathan, President, Karnataka State Co-operative Agriculture and Rural Development Bank, suggested that the Kribhco set up a fertiliser plant in the state as it already had distribution facilities in Karnataka.

NORMS FOR FERTILISER IMPORT NOTIFIED

The Commerce Ministry has notified licensing conditions for the import of fertiliser (diammonium phosphate) and services necessary for the transportation of the fertiliser to ports in India under the Japanese grant aid of 600 million yen for 1988-89.

The grant aid is intended to be used for financing payments to Japanese suppliers for import of the fertiliser by the Minerals and Metals Trading Corporation (MMTC).

According to a public notice issued by the Chief Controller of imports and exports on October 3, the import licenses should be issued for an aggregate amount not exceeding 600 million yen in favour of the importer. The licences will be issued on CIF basis with validity upto March 3, 1990, it is stated.

PFIZER

Pfizer has recommended 10 per cent interim dividend for the 16-month period ending March 1990. The dividend is payable to those whose names appear on the register on November 10 and the dividend will be payable on or after November 21.

Last year, the total dividend was 15%, consisting of 10 per cent interim and five percent final.

Haldia Petrochem in three years

The work on the Haldia Petro complex will start in the first quarter of 1990 and its completion will take 36 months. This was stated by Mr. R.P. Goenka, the private sector partner of the proposed Rs. 3000-crore joint sector project.

"Our intention is now to move ahead full steam and make a good portion of the lost time", Mr. Goenka said. "I am sure that with the fullhearted support of the Centre, the State Government and the general public, it would be possible for us to make Haldia Petrochemicals a reality within the shortest possible time."

Mr. Goenka who was talking to newsmen was not perturbed over the escalation of the project cost following the enlargement of the minimum economic size of the ethylene cracker plant from the original 140,000 tonnes to 300,000 tonnes.

"Assuming the debt-equity ratio will be maintained at the current level of 3:1, the bulk of the fund, as much as Rs. 2,100 crores, has to come from financial institutions by way of loans", he said. "Since the project has been cleared, it is now for the Centre to decide the mode of financing."

Chief Minister Mr. Jyoti Basu, Mr. Goenka said, had received recently a communication from the Union Finance Minister on the clearance of the project. "I have been told of this but I do not know the contents of the letter", he said.

He pointed out that several other clearances relating to capital goods imports, environment, water supply and other things were still awaited. However, he had no doubt that all these clearances would be available in due course of time.

As a co-promoter of the project, who will hold 25% equity, Mr. Goenka will be required to shell out a large sum of money. That too did not seem to be a major concern for him. "In the original plan, some foreign companies had agreed to subscribe to the share capital as my associates", he said indicating that under the new situation also they might be persuaded to make the same financing commitment.

However, as he felt, all these would be sorted out after the Industrial Development Bank of India (IDBI) has examined the revised estimate of the project and cleared it. The revised estimate, he said would be submitted to IDBI within six weeks.

The public sector of Engineers India Limited would help prepare the report. "We might consult foreign experts only if it is necessary", he observed.

Mr. Goenka welcomed the decision to fix the minimum economic size of the ethylene cracker plant at 300,000 tonnes. "The size of the project is mammoth and the capacity of ethylene cracker as also the downstream units are being expanded to further improve the financial viability of the project and to introduce a number of items hitherto not available in the country", he said.

Mr. Goenka, however, felt that the debate over the minimum economic size was largely philosophical. "The experts committee had earlier suggested the minimum economic size to be 250,000 tonnes, now they insist on 300,000 tonnes," he remarked. "It seems there is no hard and fast rule, how does it matter if it is 350,000 tonnes?"

The requirement of naphtha, the major raw material for the project, is estimated at 900,000 tonnes annually. "There should be no problem in getting the supply of the raw material which is now available in abundance in the country", he said. "The Indian Oil Corporation will be virtually the monopoly supplier of the product".

Mr. Goenka expressed his gratitu to both the Prime Minister Rajiv Gan and the Chief Minister Mr. Jyoti Ba

"Without their interest in the proj and active support, it would not ha been possible to attain what we ha achieved today", he said.

IDBI told to rework financial package

Union Finance Ministry has ask IDBI to "rework" the financial pac age for a bigger naphtha cracker pla of the Haldia Petrochemicals proje There was, however, no communicati received by the state on the financi clearance of the project.

Announcing this on October 12t Mr. Jyoti Basu said that the possibili of a bigger naphtha cracker was su gested to the Centre by the state wa back in March 1988.

The state's suggestion was ignore then. Evidently disappointed by th message received, Mr. Basu said, "aft long delays, there is now only this me sage of intimation of reworking of th financial package by IDBI.

IDBI had submitted techno-econom viability report on the Haldia project i September 1987. The project cost time was Rs. 1,470 crores.

Dr. Asim Dassgupta later explaine that the escalation of project cost coul be estimated at 7.5% annual inflatic rate. He said that according to the IDB report itself, the state could earn Rs. or crore a day if the Haldia Petrochem cals had come through by now.

Though official sources admitte verbal inquiries about his visit fro Delhi, they said there was no confi mation.

The official only knew that the Prim Minister would stop briefly at Calcut airport on October 17, on his way t South Asia.

IBRD-FUNDED PROJECT

IOC shortlists six foreign companies

The Indian Oil Corporation (IOC) has shortlisted six foreign companies of the World Bank-funded project for consultancy services in operation, maintenance and inspection of its pipelines.

This six companies are British Gas and Pencol of the United Kingdom, Nova Corporation and IPEL of Canada, PLE GmbH of West Germany and Danish Oil and Natural Gas Limited of Denmark. The contract is expected to be finalised next month. Under the procedure being followed by IOC, the technical bids submitted by all the bidders will be evaluated. The financial bid, however, will be opened only if the bidder is found to be the best technically. The final contract price will be fixed through negotiations.

The project is basically intended to assess the health of the IOC pipeline, some of which are very old. At present, IOC has a network of 3,761.5 km of pipelines. About half of these pipelines are over 20 years old, one fifth are 10 years old and the rest five are 10 years old. The consultancy company will ascertain the integrity of the IOC's pipelines for safe, reliable and economic operations and upgrade inspection, maintenance and repair practices utilising advanced technology in these fields.

The project will also help in achieving higher pipeline throughput, preparation of a scientific code of operating practices and update the skills of IOC personnel to meet different needs.

Since there is an increasing demand on pipelines by way of availability, flow rate and life, it is felt that remedial measures are required to be taken. These measures would be initiated after the health of the pipelines is assessed.

The measures may include replacement of defective coating and wrapping, tackling internal and external corrosion and replacement of pipelines depending on the result of pipeline surveys.

UP SPONGE IRON UNIT: USHA RECTIFIER TO TAP GAS FROM HBJ

Usha Rectifier has been provided firm and full allotment of natural gas for its Rs. 711 crores integrated hot briquetted sponge iron plant in UP. The gas is to be tapped from the HBJ pipeline.

According to company sources, the methane percentage of the gas is 85% which will increase to 98% after recovery of LPG and other hydrocarbons by the Bijaipur LPG plant and the Au Gas Cracker.

The reducing capacity of the ga expected to increase significantly, said. The cost of the gas is expected come down significantly as the price the natural gas is based on its calor value and not on the methane conte

Meanwhile, the company has iden fied two sources of supply of iron o fines for its plant at Amethi. The fi source is the National Mineral Dev opment Corporation's mines in Bai dila, Madhya Pradesh, and the other the Banaspani region in Orissa. The iro ore fines in both these locations have a Fe content of 67%.

Usha has received confirmation o supplies of 1.2 million tonnes of Ba ladila ore per annum on a longter basis. Similarly, confirmation has bee received from private mine owners i Orissa for supply of ore.

Though the transportation of ore fron Bailadila to Gauriganj is currentl through Vizag, at the time of commis sioning of Usha's plant in January 1992, the route will be much shorter The Railways have confirmed the fea sibility of transporting 1.2 millio tonnes of ore from both Bailadila in Madhya Pradesh and Banaspani in Oris sa to Usha's sliding in Gauriganj, U.P

Petrochemical giant sets example in disaster management

On Monday, July 24, 1989, the 1,500 crore petrochemical complex Reliance Industries Ltd. at Patalga, 71 km from Bombay, was hit by h floods, the like of which had not n seen in 80 years. Production at the nplex was restored in 21 days. Dhirubhai Ambani, Chairman of , gave a detailed narration at a ent press conference in Patalganga of v this was done with the help of as ny as 6,000 persons mobilised from hin the country and abroad.

There was some reluctance on the t of RIL to answer questions on the ent of damage because of its resentnt over a press report about the blic sector financial institutions bend over backwards to provide a loan of . 225 crores to the company to meet cost of the flood damage. Mr. Anil bani, Executive Director, however, ntioned later that the assessed flood nage was Rs. 60 crores and an applition was made to the financial institons for a long term loan. The cost uld have been greater had the equipnt damaged by the floods been disced. Restoration could then have en much longer.

Replying to questions about the locan of a giant petrochemical complex the banks of the Patalganga river and failure to insure the complex against ods, Mr. Ambani said there was no tory of floods in the Patalganga. He d the annual insurance premium for od damage cover for a giant petroemical unit like RIL would be as high Rs. 40 crores. This would be in addin to the Rs. 150 crores on annual intenance.

s it bad judgement to locate a giant rochemical complex on the banks of iver posing flood hazards? The guiines laid down in the exhaustive ort submitted by the Kapur Comttee on Perspective Planning of the Petrochemical Industry on considerations in the location of such plants do not specifically mention flood hazards.

The report says, "The sites for locating petrochemical complexes shall preferably have favourable meteorological and topographic features for rapid and consistent dispersion and dilution of emissions. A major consideration against locating petrochemical units on river banks is the generation of a large volume of liquid and solid wastes and the environmental hazards implicit in the discharge of these effluents into rivers." The Committee's report does not, however, advise against the location of the units on river banks for this reason.

The RIL, however, seems to have derived some comfort from the reports about the Patalganga flood having been caused by "callousness" on the part of those running the hydroelectric power projects on the Western Ghats in Pune district. The huge volume of rain in the Ghats had flooded several lakes and the project authorities were charged with having released the waters without warning into the river outlets.

Mr. Dhirubhai Ambani said that not only will the loss in production resulting from the floods be made up, the output during 1989-90 would surpass that of the previous year. The efforts to achieve this will have to be stupendous considering the targets which the company will have to set for itself. They will have to be higher than those reached at the end of March 31, 1989.

Asked how they would succeed in this task, Mr. Ambani said that among the steps taken to contain the impact of flood damage was to take up the annual maintenance and catalyst change during the three week period when the complex was shut down because of the floods. All the plants were now working to full capacity, he said.

Potential for harnessing biogas immense in India

ndia's expertise in biogas technol- and its potential for the energy tor will provide the framework for "international conference on biogas hnologies and implementation strat- es" scheduled to be held in Pune m January 10 to 15, 1990, it was dis- sed at Bonn recently.

Sponsored by Bonn's Ministry for onomic Co-operation (BMZ) and the dian Energy Ministry's department of n-conventional energy sources in se co-operation with the Bremen verseas Research Development Asso- ation(BARODA), the holding of the nference in India is being seen as a cit recognition of India's successful ack record in the use of biogas tech- ques and is being looked forward to r throwing up fresh proposals towards rmulating a biogas strategy that will nsider India's experience hitherto as 'take-off' point for enlarging on the es of biogas and refining its applica- ons.

The conference will see the partici- ation of 37 developing countries and veral multilateral organisations as also n-governmental organisations and ill focus, among others, on the Indian d German biogas experiments, with mphasis on high-tech biogas plants.

Its deliberations will cover aspects ch as intensified processes of methane oduction, low temperature biogas oduction, sewage treatment by anae- bic digestion,treatment of waste from dustrial processes, biogas plants for rge farms and animal breeding sta- ons.

India and China have come into the melight in the use of biogas, with the tter claiming some 4 million biogas nits in operation as compared to pproximately one million units in ndia. However, there has been an creasingly close co-operation between India and the Federal Republic of Germany in the shift of focus of development policy from large industrial projects to small schemes for promoting a system of decentralised energy supply for the poorer classes. In particular, BARODA has been active in promoting biogas plants in Maharashtra over the last five years.

The rise of ecological consciousness in both industrial and developing countries worldwide has led many in recent years to install pilot plants for biogas to cope with economic as well as environmental questions. Sri Lanka, Nepal, Kenya, Burundi, Tanzania, Thailand and others are reported to have launched national programmes to implement biogas technology, mainly in rural areas.

The Pune conference is expected to provide a forum for all countries to exchange notes with those enjoying longer experience with biogas programmes. Many will be looking for information on installing biogas plants on a large scale. The meet will also highlight the use of biogas in their financial and socio-economic aspects as well as their evaluation and monitoring.

Bonn has of late been laying much store by the efficacy of this energy source while reflecting its increasing emphasis on the energy sector, non-conventional sources in particular.

Perceptions of India's potential in biogas have been extremely positive. With an estimated 90 million tons of cattle dung per year produced in the country and with over 30 per cent thereof burnt in the form of dung cakes, the indications, especially for rural households, is obvious. Add another 40 million tons of farm waste and one has a pretty picture of develomental possibilities.

Participating in the Pune conference will also be guest speakers from Germany, Japan, South Korea, United States and the Netherlands who will deliver technical lectures and present case studies that will be of guidance to planners and administrators for future strategies of implementation. Co-chairing the conference will be Mr. H.P. Repnik, Parliamentary State Secretary at BMZ.

CHOWGULES MAY GET OIL RIG CONTRACT

Chowgule and Company Limited of Bombay is likely to get Oil India Ltd's (OIL) contract for charter hire of an onshore drilling rig. The rig will be used for exploration of oil and gas in the Rajasthan desert.

Chowgule had tendered for the contract in collaboration with Sondoes Petroliferos of Spain. Their price of Rs. 11.85 crores has emerged as the lowest bid among the five Indian and foreign bidders who were found technically qualified for the contract.

The second lowest bidder was Llyod Stell Industries, which quoted with Geopol GmbH of West Germany. Their price was, however, about Rs. 3 crores higher than the Chowgule prices.

The other companies in the race were Hitech Drilling Services India Ltd. with Forex Neptune International Drilling of Panama, Mahindra with Forasol SA of France, and Forasol of France, who bid independently. A letter of intent is understood to have been given by Oil India to Chowgule and the formal contract is expected to be signed sometime next month. Chowgule is expected to mobilise the rig in Rajasthan within six months.

The contract will be for two years within which time about eight to nine wells of an average depth of 3,000 metres are expected to be drilled. The first few wells will be drilled in Bikaner district.

The World Bank is funding the drilling of six exploratory wells by Oil India in Rajasthan at a cost of Rs. 51 crore. Of these, three have been drilled in the Jailsalmer basin and hydrocarbons have been discovered in all three wells. Gas has been discovered in the exploratory wells drilled by Oil India on the Tanot structure of the Jaisalmer basin. Preliminary estimates suggest that the Tanot structure can produce natural gas at a rate of two lakh cubic metres per day. This production can sustain power generation capacity of 50 mw.

Drilling in the Ramgarh structure 85 km from Tanot has shown prospects of gas at depths between 145 metres and 475 metres. The gas has over 60% hydrocarbon content. Oil India is planning to drill a number of shallow wells in the area to assess its potential. In Tanot, where more development wells are to be drilled, the hydrocarbon content of the gas is over 60%, including methane, ethane, propane and butane.

MALAYSIAN OFFSHORE OIL EXPLORATION: ONGC VIDESH STAKE IN CONTRACT-SHARING CLEARED

The Government has cleared a proposal for acquisition of 23% participating interest by ONGC Videsh Limited in an existing oil exploration and production sharing contract between four companies for an offshore block in Malaysia.

ONGC Videsh will acquire participating interest in the contract for the block SK-9 by acquiring five per cent out of the 60% stake held in it by Agip (Overseas) of Italy. The three other partners in the contract with Agip are Patronas, Petronas Carigali and OMV Malaysia. A risk capital investment of US dollar 7.494 million will be required to be made by ONGC Videsh during the exploration phase of the production sharing contract. The immediate financial commitment to be incurred by ONGC Videsh will be US dollar 3.557 million.

A petroleum ministry press release issued at New Delhi, said that an agreement in this regard is expected to be signed in Rome on October 13, between Major General S.C.N. Jatar, Chairman and Managing Director of ONGC Videsh and President of Agip.

The release also says that the block is considered to be good for discovery of hydrocarbons. While contributing 25% of the cost etc under the contract, ONGC Videsh shall be entitled to 25% share in the cost oil and profit oil from the block in case of a commercial discovery. It may be mentioned that Agip (Overseas) Limited had signed a production sharing contract with Patronas and Petronas Carigali for exploratio offshore block SK-9 in Malaysia in uary 1988. On April 25, 1989, A assigned 25% out of its 85% partici ing interest in the production sha contract in favour of OMV Mala with the approval of Petronas.

With the entry of ONGC Vide Agip will hold only 35% stake, Pe nas Carigali 15% stake and O Malaysia and ONGC Videsh 25 cent stake each. The offshore bl SK-9 in Malaysia has an area of 6,9 sq. kms and 5,000 line kms of seis survey has already been carried ou

The acquisition of stake in the c tract by ONGC Videsh will give access to oil exploration in Malaysia a South East Asia for the first time a provide it with experience in the ma agement of overseas production shari contracts. By getting familiar with t operational conditions in Malays ONGC Videsh may in future be able independently enter into a contract w Malaysia.

ONGC Videsh, which was forme Hydrocarbons India Limited has a pr duction sharing contract with Petr Vietnam for exploration and exploit tion of petroleum in Vietnam in an o shore area covering over 14,000 squa kms. seismic surveys have already be launched under this contract.

urplus gas in Western region by 1994-95

An expert working group, headed by r. Lovraj Kumar, has estimated that ere will be a surplus of 20 to 25 mil-n cubic metres of natural gas per day the western regic i by 1994-95 even ter the various ci rrent projects for its e have been implemented.

In a detailed blue-print on the natural as demand and availability in the gion, the working group has recom-ended the laying of a new pipeline onnecting mid-Tapti and south Tapti ructures of the Oil and Natural Gas ommission to a landfall point on the aurashtra coast. From the landfall oint, the pipeline could go on land hrough various parts of power-starved aurashtra to join with up the existing azira-Bijaypur-Jagdishpur (HBJ) peline.

The proposal has been advanced as etter alternative to the linking up of ese structures with the existing nder-sea pipeline from the Bombay igh because that proposal calls for oubling the capacity of the pipeline.

The working group was set up last ear in the wake of an unusual seminar n gas utilisation organised by a non-overnment research organisation, the ujarat Foundation for Development lternatives. The working group led by Ir. Lovraj Kumar and including a umber of experts has now come out ith the detailed recommendations.

Releasing a copy of the recommen-ations to newsmen at Ahmedabad on ctober 12, Mr. Sanat Mehta, Chair-an of the foundation and a former inance Minister of Gujarat, said that ne report has been sent to the Prime inister Mr. Rajiv Gandhi.

Mr Gandhi was in Gujarat recently to y the foundation stone for a Rs. 2,290 rore petrochemicals complex at Gand-ar, which was yet another proposal for fuller utilisation of gas available from ne oilfields in the western region.

Mr. Mehta said the report was not a political exercise but a purely economic one which has sound justification for everything demanded. The economic and social development in the state was given an impetus by the discovery of oil and gas in the 1960s, but in the recent years the high rate of growth of industry has been threatened by the prospects of a crippling power shortage.

In the Seventh Plan, the power supply in Gujarat fell short of demand by about 800 mw of installed generation capacity.

In the Eighth and Ninth Plans, the shortfall would shoot up to 2,900 mw and 6,000 mw respectively. The impending energy crisis cannot be averted except through the harnessing of natural gas for power generation, among other things.

This is because Gujarat has no coal reserves, is so far flung from collieries that coal-based power becomes one of the costliest in the country and there is just not enough rail capacity available to haul it in any case, it also has no hydro-power generation resources.

Recognising this, the Centre has already permitted the setting up of three gas-based power stations, one of which will be at Pipavav on the Saurashtra coast, utilising gas from mid-Tapti and south Tapti structures.

The working group has pointed out that production, currently put at 2.8 million cubic metres of gas a day, would go up to at least six million cubic metres by 1994-95 from the existing fields only. The new field of Gandhar would be adding another eight million cubic metres per day by that time. Taken together, the production from various western region offshore fields could go up to around 75 million cubic metres a day as compared to the current 20 million cubic metres of gas. This meant

there would be a surplus of about 20 million cubic metres a day natural gas even after meeting the committed requirements of various users to be supplied through the HBJ pipeline, the group said.

The Lovraj Kumar group said that this surplus could play a crucial role in reducing the shortage of energy in Gujarat.

The power requirements alone by 1994-95 would be short by about 3,000 mw and for meeting this alone an allotment of six million cubic metres of gas per day was needed, with provision to step it up to 12 to 15 million cubic metres a day by the year 2000.

It said that development of a secondary distribution network and city distribution systems could help considerably in industrial, commercial and domestic sectors in energy supplies.

Such systems could be first planned between Ahmedabad in north and Vapi industrial area in the South Gujarat. It could later on be further extended in north upto Mehsana.

The group said that two of Gujarat's major fertilisers complexes now use petroleum products — the Gujarat State Fertilisers Company uses naphtha and Gujarat Narmada Valley Fertilisers company uses the fuel oil.

If both these can get about three to five million cubic metres a day. It would mean release of other products for transportation to other parts of the country. These could also increase the plant capacity through low cost debottlenecking.

The group pointed out that the Gujarat Industrial Investment Corporation has, with Mafatlal Fine, set up the Gujarat Gas Company Ltd to undertake distribution and utilisation of natural gas within the state.

It could take up the distribution of 12 to 18 million cubic metres of natural gas a day for power, fertiliser and secondary distribution systems, help develop secondary energy distribution networks in Vapi-Ahmedabad-Mehsana belt, undertake city distribution including to major industries and co-operatives and develop infra-structure to deliver gas to power plants.

The Lovraj Kumar group said that since the pace of development of the Gandhar onshore and mid-Tapti and south Tapti offshore fields would to a large extent be governed by the speed with which increase in gas consumption was ensured in the state, gas-based power stations should come up quickly.

The Centre has agreed to loca three such stations, two of which w be in the state sector and one in the C tral sector.

It said there was a basic conflic the present pricing system of coal natural gas. Since coal is priced on basis of the cost of production plus h of the cost of transportation, Guj pays one of the highest coal price the country.

On the other hand, although nat gas is produced in and around the st the price payable in Gujarat is the sa as is in other states which are far av from the sources of gas productio

This resulted in a double disadva age for the state and the formula fixing gas price needed an early revi

The group also stressed the need step up research and development eff currently, at low key, for harness underground coal reserves in north G arat, estimated at 63 billion tonnes gasification.

Conversion of such deep reser which cannot be mined could prov about 15,000 billion cubic metres natural gas. This was such a huge qu tity that it would not only meet needs in Gujarat, but would also be a to feed surrounding states easily.

NFY EXPORT OBLIGATION OFF

Caprolactam imports allowed

Import of caprolactam, the basic raw material for the nylon industry, has now been permitted without any obligation on the industry to export nylon filament yarn. The Union Finance Ministry has taken this decision following the recommendation from the Union Textile Ministry to delink import of caprolactam from the export of NFY, it is learnt.

For the current year, the government had earlier released import licences for the NFY manufacturers to meet 25 per cent of their caprolactam requirement. This was followed by issue of additional import licences recently to cover another 25 per cent of the requirement, with an obligation to export nylon yarn by the importers.

The Union Finance Ministry wanted that the industry should try to earn maximum foreign exchange to meet the ever increasing foreign exchange requirement for the import of caprolactam.

The Textiles Ministry, however, was worried that if the industry is compelled to export yarn without any exportable surplus, there will be a severe shortage of NFY in the country and the art silk weavers may be adversely affected as a result of inadequate supply and high prices.

GSFC is the lone producer of caprolactam in the country at present and the other unit FACT is unlikely to commence commercial production within next few months.

Against its installed capacity of 20,000 tonnes, GSFC has captive consumption of around 6,000 tonnes and 5,000 tonnes to meet Gujarat Nylons' (its subsidiary) requirement, leaving around 9,000 tonnes marketable surplus, which is around 20 per cent of the nylon spinners' annual requirement.

Thus, the industry has still to depend on imports to meet 80 per cent of its raw material requirement. The government had earlier released licences for 25 per cent and licences for additional 25 per cent are being issued at present. The authorities reviewed the indigenous supply position at a meeting held in New Delhi recently.

HDPE WOVEN SACKS: EIGHT MANUFACTURERS FORM EXPORT COMPANY

An export company has been formed by a consortium of eight out of the eleven manufacturers of HDPE woven sacks in Orissa with a view to expanding their market so far limited to the borders of the state and to achieve competitiveness in terms of volume of orders, price and delivery schedule.

Stated to be a pioneering effort in the country on the lines of a suggestion made to the industry by the Plastics and Linoleum Export Promotion Council, the Plastic Woven Sacks Impex (P) Ltd., now in the process of being registered with the registrar of companies, Cuttack, includes in its fold units having a total installed capacity of 20 million bags per annum, according to Mr. H.K. Mohanty, president of the Orissa HDPE Woven Sacks Manufacturers Association. The units are located in Balasore, Bhubaneshwar and Cuttack.

Mr. Amit Behera, vice-president of the association, has left for Holland to negotiate a substantial contract, Mr. Mohanty told The Economic Times. Inquiries have also been received from Dubai through the Trade Development Authority (TDA) for five lakh bags and customers in Singapore too have shown interest in buying from Orissa, he said.

Mr. Mohanty said the export consortium company would disburse the cash compensatory support benefit to member companies in proportion to their actual export. He said the HDPE units in the state were last year able to secure about Rs. 3 crores worth of orders from the state-owned Industrial Development Corporation of Orissa Ltd. (IDCOL) for its cement plant at Bargarh in Sambalpur district and about Rs. 2 crores from Paradeep Phosphates Ltd., a joint venture of the government of India and the Republic of Nauru. Following a stay order issued by the Orissa High Court on the operation of the central order on mandatory jute packaging, the HDPE units could also secure five per cent price preference.

The provision in new industrial policy (1989) of the Orissa government for 50 per cent subsidy against costs of foreign travel for export promotion and for acquiring membership of export promotion councils would be very helpful in executing the plan to make a dent in the world market for HDPE sacks, he observed.

Mr. Mohanty disclosed that Polyolefin Industries Ltd. (PIL) has responded positively to the Orissa sacks manufacturers demand for prompt supplies of HDPE granules and had assured that it would send a team of senior executives soon to work out a scheme in this regard.

HIKE IN GUARANTEE PREMIUMS: PLASTIC SSI UNITS HIT HARD

The All India Plastics Manufacturers Association has strongly protested against the recent decision unilaterally taken by the Deposit Insurance and Credit Guarantee Corportion (DICGC) to increase the rate of Guarantee Fee from 0.50% per annum (for limits upto Rs. 25,000) and 0.75% per annum (for limits above Rs. 25,000) to 1.5% per annum. This steep hike in the credit guarantee fee to be charged by DIGCC to the banks and by the banks, in turn to their constituents will cause great hardship to many SSI units and is a unfair burden on a sector the Govern

ment should be supporting, according to a press release issued by the association in Bombay recently.

"SSI units are groaning under a host of financial constraints and the present move would not only wipe out the net earnings of the units but also affect their modernisation programmes", adds Mr. Vijay V. Merchant, President AIPMA.

"If the premium has been hiked by the Insurance Corporation with the reason the credit guarantee fee had to cover the loss due to default of bad parties, the correct step is to hold bank managers accountable for poor controls and assessments of lending, not burden the good units who borrow and pay in time. Much better recovery is possible if the Bank managers and executives are sincere in monitoring accounts and participate in growth of the units in their charge.

There are several branches of banks that have proved this point where managers do their jobs well and report zero sickness of SSI units. Furthermore, the main reasons plastic units have gone sick are (a) most unfair and impractical Jute Mandatory Order — stifling plastic woven sack units in India (b) repeated power failures and load shedding making plastic processing very costly in several regions, (c) Unrealistic high ad valorem duties on raw materials which went on rising with weakening of rupee and spiralling resin rates in 1988.

All these are policy failures of the Government and not poor management of SSI plastic units as put across by some bankers. The Small Scale Sector is burdened with high interest rates of 13.5 per cent on medium term loans and 15.5 per cent on working capital. Consequently they no longer enjoy the real priority sector status accorded to them. With such high rate of interest, the total incidence of burden on the funds borrowed by SSI units may be well above 18.5% per annum. This rate is higher than the interest rate applicable to non-SSI units.

Under these circumstances, to categorise SSI units as "priority sector" is not actually true, says the release. The associations have noted that for saving the SSI units from such uncalled for burdens, the Government should see to it that atleast the Guarantee Fee is restored to the original of 0.75% per annum. "The SSI sector do not have the alternative of getting funds from other sources like the stock exchange, etc. and hence the Finance Ministry should realise the vulnerability and weakness of this segment and take positive measures to support," says the release.

NARORA ATOMIC PLANT DEDICATED TO NATION

The Prime Minister Mr. Rajiv Gandhi, dedicated the Narora Atomic Power Station to the nation at a public rally in Narora on October 15. Landing at a helipad near the plant, Mr. Gandhi drove to the rally site and from a dais declared it "inaugurated".

Observing that electricity was essential for development, Mr. Gandhi hoped that the plant would prove a boon to the people of Uttar Pradesh and help in accelerating the State's progress and development in various fields.

Mr. Gandhi assured the State Chief Minister, Mr. N.D. Tiwari, that the Centre would consider the demand of the State getting the full power generated from the Narora plant. The question was not whether Uttar Pradesh got all its power from the plant or not, but that it got power for all its needs, he said and added that he, however, could not promise whether another atomic power plant would be sanctioned for the State or not, but the feasibility would have to be examined.

Dr. M.R. Srinivasan, Chairman, Atomic Energy Commission, said the first 235 MW unit at Narora attained criticality in March 1989. After completion of extensive low power tests, the unit was synchronised to the U.P. grid and was now operating under testing at 50 per cent of full power. The power output was being fed to the grid of the Northern Electricity region.

Safety steps incorporated

He said the Narora station, the country's fourth nuclear power station, was the second one to be designed and built indigenously. The Station incorporated design features to ensure a high level of safety, in line with current international standards. The pre-stressed concrete reactor building, designed to withstand high internal pressure, is surrounded by a reinforced concrete secondary containment. The site being in a moderately seismic region, great care had been taken to arrive at designs that fully met with the requirements.

Dispelling fears that the plant posed a risk of pollution to the Ganga, Dr. Srinivasan said adequate safeguards have been taken to ensure that any such possibility does not arise. He said 10 more reactors of the Narora type were coming up at Kakrapar, Rana Pratapsagar and Kaiga. The Govt. had cleared sites for six reactors of 500 MW capacity each. Decisions on six more 500 MW reactors are expected to be taken next year. Some developing countries have expressed interest in the 235 MW and 500 MW reactors and there could be export opportunities in the future, he added.

IPCA MEET IN DECEMBER

The annual conference of the Indian Pharmaceutical Congress Association (IPCA) will be held combined with an exhibition at Bombay from December 15. It will be inaugurated by Prof. M.G.K. Menon, Scientific Adviser to the Prime Minister and Member of the Planning Commission. The 41st annual convention of IPCA will be internationalised for the first time. Delegations to the event are expected from several overseas pharmaceutical associations.

SSI PLANTS

Pollution control kits off ceiling

The Union Government has decided to exclude pollution control equipment and pure Research and Development (R & D) machinery from the computation of the ceiling of plant and machinery for small-scale and ancillary industrial undertakings.

These items of plant and machinery, according to a press note (No. 25 of 1989 series) issued by the Department of Industrial Development on October 11, contribute to the modernisation of industrial undertakings. This relief is being provided to the small sector to enable it maintain its tempo of performance in the domestic and international markets.

For an unit to be registered as a small ancillary undertaking, the present ceiling is Rs. 35 lakhs in the case of small-scale enterprises and Rs. 45 lakhs for ancillary units. The expenditure on pollution control and R & D equipment by a small unit will not be taken into account while computing the value of plant and machinery in the definition of small-scale/ancillary industrial undertakings.

Accordingly, the press note said that clarifications and explanations on the definition of small/ancillary units issued by the then Ministry of Industry and Civil Supplies (Department of Industrial Development) on May 19, 1975 have been modified.

The modified press note would now read: "in calculating the value of plant and machinery, the original price paid by the owner, irrespective of whether the plant and machinery are new or second-hand, will be taken into account."

The cost of equipment such as tools, jigs, dies, moulds and spare parts for maintenance and the cost of consumable stores will be excluded in computing the value of plant and machinery. Similarly, the cost of installation of plant and machinery will also be excluded. The cost of R & D equipment and pollution control equipment will be excluded in computing the value of plant and machinery.

In the case of imported machinery, import duty will be included, but not the miscellaneous expenses like transportation from the port to the site of the factory, demurrage if any paid at the port and premium if any paid for import entitlement. However, shipping charge, customs clearance charges and sales tax should be included in computing the cost of plant and machinery.

The cost of generation sets, if any installed will be excluded. Similarly, the cost of extra transformers etc. which have to be installed by the units as per the regulations of the State Electricity Boards (SEBs) will also be excluded. The bank and service charges paid to the National Small Industries Corporation or to the State Small Industries Corporation will be excluded in computing the cost of plant and machinery.

The small sector has witnessed significant growth in recent years with over 1.5 million units producing a wide range of consumer goods, ancillaries and components which have made a mark in major thrust areas like electronics, plastic products etc. Broadening of the entrepreneurial base and decentralisation of industrial growth in the country have been the other achievements. Growth with diversification has enabled the sector to play a significant role in meeting the demand for products both at home and abroad. A major portion of its exports is non-traditional items and the sector accounts for 30 per cent of the total exports from the country.

The concession announced for the installation of pollution control and R & D equipment is aimed at giving a boost to the modernisation of the units while remaining within the definition of the small sector with all the other incentives and advantages.

INDIAN BAN ON HAZARDOUS WASTE

The movement of hazardous waste from other countries to India for dumping and disposal has been banned. The Hazardous Wastes (Management and Handling) Rules issued by the Ministry of Environment and Forests stipulate that any trans-boundary movement of hazardous wastes can take place only after permission is granted by the State Pollution Control Boards based on the technical information furnished by the exporter and importer.

If such wastes are required as raw material by any industry, the parties will have to provide necessary information to the concerned authorities who will decide each import on merit. The Ministry of Environment and Forests and the State Pollution Control Boards have been authorised to implement the rules.

Several Ministries are concerned with the ban of hazardous chemicals. The Agriculture Ministry has taken steps to ban DDT completely in agriculture and to restrict its use in Public Health. Another commonly used pesticide, BHC has also been restricted.

The case for banning 23 pesticides, food chemicals and industrial chemicals including asbestos is under consideration of the Supreme Court through a writ petition.

The Ministry of Environment and Forests has also brought in necessary rules to phase out the use of benzidine dyes on a country-wide basis following the recommendations by an expert committee. The manufacture and use of benzidine based dyes are continuing in India despite its ban throughout the world because of its carcinogenic potential.

A Crisis Management Plan has been prepared by the Ministry to meet chemical emergencies that are likely to occur in units handling hazardous chemicals. The Crisis Management Plan provides a three-tier system — a Central Crisis Group, State-level Crisis Groups. The guidelines for the preparation of Crisis Management Plans have been issued to the State Governments.

Financial assistance for the creation of a management structure for hazardous substances has been given to the States of Andhra Pradesh, Assam, Bihar, Goa, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Tamil Nadu and Uttar Pradesh.

Meanwhile, the Environmental Safety Committee an expert group set up to ascertain the status of compliance of various recommendations pertaining to 52 polluting industries in Maharashtra, has found that only few industries have carried out risk analysis so far. Education of the public in the vicinity of the units by industries is also inadequate, according to the committee.

BUILDING MATERIAL FROM CHEMICAL WASTE

Phosphogypsum, a most health-hazardous chemical waste, can now be converted into a building material by using a new Soviet non-waste technology.

More than 100 million tonnes of phosphogypsum lies in dumps around big cities and factories, making up as much as 30 per cent of manufacturing expenses and are a serious threat to the environment: the water-soluble admixtures penetrate into the soil, poisoning nearby streams, lakes and sub-soil waters.

Specialists from a design institute under the Soviet Ministry of the Nuclear Power Engineering have developed and put to use a technology of continuous production of gypsum binders and construction materials on the basis of phosphogypsum.

The ex-waste turns out to be fit for making excellent partitions and sound-absorbing panels, matchboarding and building rocks. Phosphogypsum walls are not health-hazardous assures Victor Prikhodko, candidate of technology, who leads the developing team.

"At the processing stage, the fluorine and other noxious compounds are removed. Under our technology, whose author is engineer Vladimir Kornev, phosphogypsum is neutralised and then the pulp is filtered and the filtrate re-utilised. Neutralised phosphogypsum undergoes continuous heat treatment in an original plant. The gypsum binding is continually ground to be made into building blocks".

The Soviet technology is altogether different from the analogous foreign technologies. The preset heat treatment variables ensure the production of top-class homogenous material with minimal fuel and energy inputs.

The process is continuous and waste-less. Unlike foreign plants, the Soviet model does not emit gas, dust and wastewater, which are all recycled, said Kornev.

SWEETENER UNIT SET UP IN TAMIL NADU

The works initiation on a Rs. 20 crore joint sector integrated biotechnology project at Cuddalore in Tamil Nadu's South Arcot district recently, marks a significant shift in this technology application and augurs well for the new investment climate being created in the state.

The new company, 'Ushta-te Biotech Industries', promoted by the Tamil Nadu Industrial Development Corporation (TIDCO) and a Calcutta-based special cialised engineering firm, would for the first time in the country manufacture on a large scale high fructose syrup (HFS) said to be a 'major innovation' in starch sweeteners.

This agro-based project, whose foundation stone was laid by the state chief minister, Mr. M. Karunanidhi, will employ state-of-the-art technology in processing tapioca, grown abundantly in the region. The project is expected to provide employment for about 1200 persons.

According to the company's project profile, HFS, to be mainly used by soft drinks manufacturers, in confectionary and processed foods, has the same sweetening power as sugar, besides other advantages like lower microbial growth.

Explaining the features of the project at the foundation stone laying function at the SIPCOT (Small Industries Promotion Corporation of Tamil Nadu) industrial complex at Cuddalore last month-end, the private promoter, Mr. K.N. Dadina, said the project's viability increased with a multi-product range, which included high purity starch, dextrose monohydrate (DMH), and compounded animal feed.

The plant would collaborate with a West German firm in utilising the latest developments in enzyme engineering, the project profile said. It will annually produce 6,600 tonnes of HFS, 6,270 tonnes of glucose syrup, 3,300 tonnes of DMH, 1,155 tonnes of dextrose anhydrous, 7,400 tonnes of high purity starch and 22,440 tonnes compounded animal feed.

TIDCO holds 26 per cent of the share capital with a contribution of Rs. 1.86 crores, while the private promoter's contribution is 25 per cent. Public financial institutions including the ICICI have sanctioned the necessary term loans for the project.

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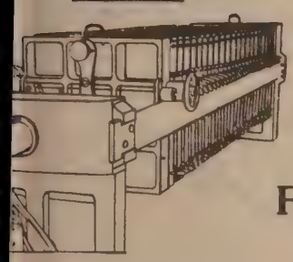

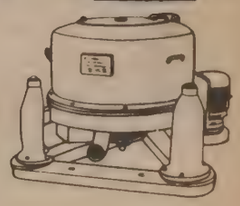

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SPOTLIGHT ON
Biotechnology and Life Sciences (Part 2)

VIRUS RESISTANCE ENGINEERED INTO POTATOES

Potatoes have been genetically engineered for resistance to potato viruses X and Y (PVX and PVY) by scientists at Monsanto. Resistance has been demonstrated in Russett Burbank potatoes.

Monsanto researchers report that the new technology is significant because two different genes in potatoes protected against the dramatic dual effect of PVX and PVY. Researchers inserted into potato plants genes from the two viruses, which direct the viral coat proteins.

In genetically engineered potato plants, the presence of the coat proteins in the plant cells prevents the viruses from infecting the plant. (*C & EN*, 2/13/89, p. 27).

RESEARCH THROWS NEW LIGHT ON CELLULOSE BACTERIAL & NITROGEN FIXATION

Bacteria that 'fix' nitrogen from the atmosphere into nitrogen compounds are essential for the fertility of the soil. In order to fix the nitrogen, these bacteria need readily available sources of energy. One potential source is cellulose. However, biologists were unsure until recently whether it provided food for bacteria that fix atmospheric nitrogen.

Recent research by S. Leschine and his colleagues at the University of Massachusettes at Amherst has shown that four strains of bacteria involved in the breakdown of cellulose can fix nitrogen from the atmosphere. The bacteria were all anaerobic.

The researchers isolated the four strains from forest soil and fresh water mud and grew the bacteria in two liquid media, both of which lacked nitrogen compounds but included cellulose.

The team exposed one culture to gaseous nitrogen and the other to an inert gas, argon. They found that much of the cellulose in the liquid exposed to nitrogen had gone after a period between 7 and 14 days. The amount of cellulose exposed to argon remained unchanged.

Leschine's group also showed that the bacteria contained nitrogenase, an enzyme involved on fixing atmospheric nitrogen.

Many soils are rich in cellulose, but contain few nitrogen compounds — for example, peat soils or municipal or agricultural waste sites. The researchers point out that it would be possible to make such soils much more fertile by adding to them these bacteria. (*New Sci.*, 6/10/89, p. 33).

RESEARCH PROGRAMME TO DEVELOP BACTERIA FEEDING ON NITROGLYCERINE & TNT

Biochemists in New Mexico are feeding nitroglycerine and TNT to soil bacteria. Their aim is to devise a new way of disposing of explosive waste products.

Cleaning up waste with bacteria is much cheaper than other methods, according to Patricia Unkefer, researcher at Los Alamos National Laboratory, who is investigating how bacteria can breakdown explosive hazardous waste chemicals. For every dollar spent on this method it will take between $10 and $100 to do the same job by handling of the explosives and burning or burying them.

UnKefer has spent a year visiting dumps at factories and storage sites around USA taking samples of soil contaminated with explosives. She then grows the bacteria in the soils in culture to determine which chemicals they digest and how the weather can affect their efficiency. (*New Sci.*, 6/10/89, p. 35).

EPRI RESEARCHERS TESTS NATURAL MICROORGANISMS TO CLEAN-UP TOXIC WASTES

Research into a relatively new biotechnology area called 'Genetic Ecology' is receiving strong support from Electric Power Research Institute, (EPRI), Palo Also, California. The EPRI researchers are looking at this method as a way of using microbes to clean up toxic wastes on utility companies properties. Genetic ecology is not the same as genetic engineering. Genetic ecology involves entrancing the toxic waste destruction properties of naturally occurring bacteria rather than designing new microorganisms. This concept was first proposed by Prof. Betty Olson at the University of California (Irvine).

This concept opens up a brand new area of research that could have great potential destroying toxic wastes in-situ, either on land or in water. The key to the new method is to understand and manipulate the natural duplication and transfer of a group of bacterial genes called 'operon', that control a sequence of enzymes that degrades specific toxic wastes. Researchers are using organisms already present at a site. These have better chance of surviving than those created in the laboratory and then introduced to a site.

The researchers are studying the use of these systems on metals and organic

wastes. The types the researchers are looking at initially are mercury and polycyclic aromatic hydrocarbons (PAHs). Later on, they will expand out the list to include polychlorinated biphenyls (PCBs), trichloroethylenes (TCEs), organic wood preservatives and other hydrocarbons. They are also interested in controlling and preventing biocorrosion.

EPRI notes that cleaning up these toxic waste sites with present methods can cost from $ 50 to $ 300 million per site. Using genetic ecology could drastically lower that cost. One of the first substances, that EPRI researchers are examining for treatment the naphthalene — a two ring PAH. Another part of the research programme under Dr. David Gibeon (Univ of Iowa) is working on gene sequence of operons that can control the destruction of highly toxic multiple ring PAHs.

In the metals portion of the project mercury was chosen as a target compound because of concerns that low level concentrations found in remote lakes may be the result of utility operations. It is thought by some researchers that the mercury comes directly from the burning of coal, or that its biological availability is increased at low pH, possibly as the result of acid rain. The chemical of concern in this research work is methyl mercury, which has been found in some fish and other aquatic life.

There are some indications that the microorganisms under study have operons capable of at least partially destroying methyl mercury. The goal of the research is to find ways of increasing the effectiveness and dependability of these operon systems. (*R & D*, March 1989, p.p. 18-20).

MODERN MAN — THE GREATEST SCOURGE ON THE PLANET EARTH

The geologists and ecologists at the recent international workshop on geology and global change at Interlaken, Switzerland condemned Man as the greatest scourge on the planet earth. It blamed Man as the root cause for the coming mass extinction of living matter and biodiversity on the green planet. The future mass extinction of living matter has a single, unprecedented, cause: Man.

The geologists at Interlaken compiled a graphic catalogue of Man's impact on the planet. He (homo sapiens) scrabbles 50 billion tonnes of minerals from the ground each year, in so doing shifting the equivalent of 3-times the sediment moved each year by the world's rivers.

This process leads to inevitable leakage from the minerals-to-goods cycle, causing an exponential rise in toxic metals in seas, lakes and soils. He mines and burns billions of tonnes of coal each year, so venting a further Pandora's box of wastes, including carbon dioxide, the principle (current) contributor to the green house effect.

Feeding himself with carelessness typical of his tenure, he causes the erosion of 25 billion tonnes of soils each year, 0.7% of the total farmable soils, soils which took thousands of years to form. He lays down 30 kgs. of fertiliser per person each year to increase his crop yield, so polluting the water he must drink.

His accidents and spillages leave their imprint everywhere. Dioxins from the chemical industries find their way into the tissues of polar bears. Radioactive particles from his nuclear bombs and reactors accumulate at the south pole within days of their release.

The litany of misadventure is only partial. Yet man's insults to the natural rhythms of the planet are compounded as his population grows. Greater numbers of people mean that more food must be produced from the dwindling farmlands, more minerals scrapped from the ground, more wastes and spillage added to the environment.

The geological history of the plane preserved in rock strata has been likened to the life of a soldier: long periods of boredom interspersed with moments of terror. No terror has been greater than that associated with the few moments man has been on the scene.

There were various opinions on offer in Interlaken workshop as to what was most likely to cause the demise of Homo Sapiens unless he refashions his approach to the environment. Some, for example, thought, it would be reduction of biodiversity: that we would not survive the collapsing ecosystems as the rainforests are cleared and the greenhouse hots up.

Others thought it would be pollution of the oceans: that we would allow the build up on toxins to a level that would prove to be a critical threshold. One eminent geologist, professed that it would be the 'microbiota' evolving deadly new strains in the face of the barrage of toxic wastes.

Many of the scientists at the meeting proferred the 'Martian View' which holds that the demise of man is inevitable — and indeed that the planet would be better off without its dominant species.

Others preferred the 'optimist view', which holds that man has it within him not just to survive but also to stem the rate of extinction; that the issue in doubt is not his intelligence, but his collective will. (*New Sci.*,6/10/89, p. 62).

THE VEGETABLE GENE BANK AT WELLESBOURNE, WARWICKSHIRE UK FACES A CRISIS

A gene bank that is responsible for conserving for the world many species of vegetables — including carrots, cauliflowers, cabbages, onions and leeks —

threatened by the British Government's cuts in support for agricultural research.

This vegetable gene bank at Wellesbourne in Warwickshire (UK) is described by the International Board for Plant Genetics Resources in Rome as one of the most important temperate vegetable gene banks in the world.

Its collection of Brassica land races (including cauliflowers, broccolis, cabbages, Brussels sprouts, swedes, kales, turnips and mustards) makes it unique.

British efforts at genetic conservation are scientifically highly regarded but organisationally diffuse and uncoordinated.

The above vegetable gene bank at Wellesbourne has taken on world responsibility for conserving species of Brassica Allium (including onions and leeks) and Daucus (carrots).

When Wellesbourne accepted its responsibility for the world collection of Brassica and Allium, it signed a document promising to notify the UN's Food & Agriculture Organization and the IBPGR if there was ever any uncertainty over the security of the base collection held there.

Yet Wellesbourne, which needs an annual budget of just £ 115,000, is currently short of £ 24,000 per year. Its administrators are so worried about its future that they contemplated launching a public appeal to save the gene bank. It has commissioned a study to find out the best form such as appeal might take.

Many leading scientists in UK look at this gene bank as a national asset, yet there is no statement from the British Government that it is really committed to full funding of this gene bank.

This may be because this gene bank owes its existence not to parliamentary sanction but to a public appeal launched by OXFAM in the late 1980s.

The spur for that appeal came from the EEC, whose legislation on plant varieties spelt extinction for hundreds of old vegetable varieties.

Oxfam's appeal raised enough money to build the gene bank and to fund it for seven years. The fund ran out in 1987. (*New Sci.*, 6/17/89, p.p 32-33).

STANFORD UNVEILS NEW METHOD OF STUDYING LEVELS OF ACTIVITY FOR SPECIFIC GENES

Stanford University of California has recently announced that it has developed a new method of studying levels of activity for specific genes in individual cells, which may lead to 'novel studies' of the way genes are regulated and expressed in diseases such as cancer and AIDS.

Using rDNA technology, Dr. Leonard Herzenberg and his colleagues label genes with fluorescent tags, known as reporter genes, so that they can be identified and isolated when activated. (*Scrips*, 5/19/89, p. 29).

HIGH-TEMPERATURE RESISTANT MICROORGANISM TO BE FIELD TESTED FOR DEGRADATION OF WASTEWATER

A process for treating hot effluents — (45-75°C, Vs 25-35°C) for methods using conventional microorganisms — will be tested at an undisclosed Kuwaiti Chemical Complex on the Persian Gulf.

A pilot unit will employ a temperature-resistant strain of Bacillus brevis microorganisms to anaerobically degrade wastewater containing hydrocarbons and alcohols.

The route could have widespread application in the Persian Gulf region, where summer temperatures sometimes reach 50°C, reports Geoffrey Hamer, director of the research effort at the Eidgenossiche Technische Hoehschule (Zurich, Switzerland), which developed the process. (*Chem Engg.*, 7/1989, p. 19).

WORLD'S FASTEST BIOTECH SCANNER LOOKS AT 10 MILLION CHARACTERS/SEC.

Applied Biosystems has just obtained an exclusive licence to what is said to be the world's fastest text scanning technology, from TRW. It is specifically for biotechnology, research and analytical chemistry applications. The so named Fast Data Finder (FDF) technology is capable of scanning up to 10 million characters/sec., according to the company. One area in which FDF technology will be of particular use is in DNA sequencing.

Projecting biological significance from raw sequence data requires searching the data for complex sequence patterns that represent control or coding regions for genes including comparison with previously published sequences. To date there are about 30 billion based on DNA sequence.

This particular system is said to provide the required speed and flexibility to suit the task at hand as it can conduct multiple queues simultaneously without sacrificing speed.

When properly embedded in a genetic engineering work station, currently under development at Applied Biosystems, the FDF will allow the interactive query of experimentally growing DNA data bases which would otherwise need either an expensive main frame or a supercomputer. (*Mfg. Chemist*, 7/1989, p. 55).

A COMPUTER-BASED BIOENGINE FOR PHARMACEUTICAL R & D ON THE HORIZON

The most powerful computer system

available for analysing, modeling and designating biologically active molecules and polymers has been launched by Proteus Biotechnology and Norsk Data.

The Bio-Engine combines for the first time expertise from the different areas of hardware, biochemistry, pure mathematics and programming to produce a flexible tool.

Pharmaceutical companies spend big money on R & D and competition is intense. Each new product can take 12 years to reach the market at a cost of up to £ 100 million, and many more potential products have to be abandoned in the process.

The developers believe that the Bio-Engine could reduce the cost of the chemical development by up to 90% and cut the development time by 2-3 years, saving money and allowing companies to explore a wider range of products.

What can the new system do? By using quantum mechanics, molecular dynamics, simulated kinetics, gene data and structures of proteins and small organic molucules to address a range of problems in pharmaceutical, veterinary, agrochemical and biodegradable products.

Proteus itself has a number of compounds designed on the BioEngine that are now being tested in the laboratory. These include:

* A drug for the treatment of prostrate cancer.
* An animal neutering compound.
* Possible synthetic peptide based AIDS vaccines.
* A polymer antiskid runway coating.

The BioEngine is driven by GLOBAL a fifth generation computer language and expert system.

Software is optimised to run on the Norsk Data 5,000 series of super mini computers but large design problems may need super computer power.

The system is open ended so it never dated and is user friendly — a scientist can add to it and develop his own programmes as he goes along, to make use of his own knowledge.

Some of the latest artificial intelligence ideas are incorporated, including fuzzy logic and neural nets. The Bio-Engine can also pick out unlikely projects — for example, by estimating potencies. However, toxicity testing is still essential because the system cannot predict what will happen in the body.

As far as buying the BioEngine is concerned, the biggest system (with super computers and transputer) will set you back a cool £ 22 million, but lower cost add on options suited to IBM PCs start at £ 5000. (*Chemistry In Brit*, 7/1989, p. 679).

Chemical Plant Developments

JAMES LOCK
Consultant-Editor, 'Processing, London

STRESS WAVE SENSING

Stresswave Technology Ltd., a new subsidiary of the car and aero engine manufacturer Rolls-Royce PLC, has launched a revolutionary sensor which uses sound to monitor and control industrial processes and machinery.

The Stress Wave Sensor is compact and robust and converts high frequency structure-borne stress waves produced by most physical processes — such as impacts, friction, fluid flow, machining and defect growth — into electrical signals that can be used to monitor and control a wide range of industrial applications and processes.

The heart of the technology lies in an integrated sensor. It is small enough to fit in the palm of a hand, and is simply mounted in a non-invasive manner by a bolt to the equipment in question. Because stress waves are transmitted within a solid in all directions, the positioning of the sensor is not critical.

The sensor contains a piezo-electric crystal which detects stress wave activity and converts it into an electrical signal. This is amplified and processed, using enveloping techniques. Innovative circuit design and thick film hybridisation has allowed the transducer and its associated processing circuitry to be contained within the sensor unit itself.

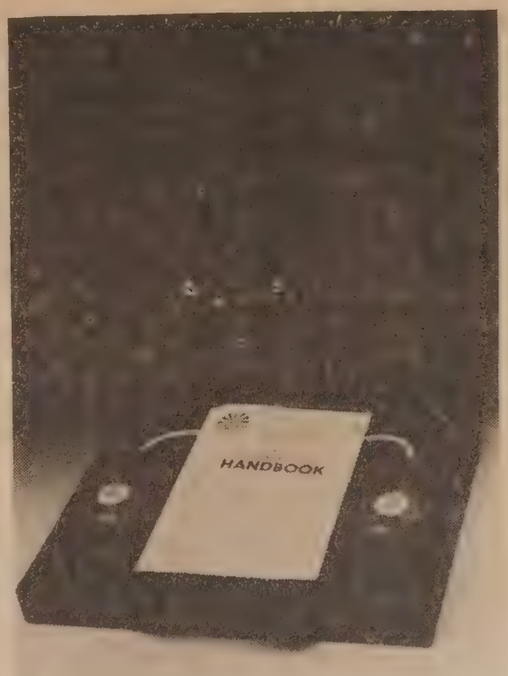
This hybrid element is mounted in a rugged housing to make it easier to handle and to protect it from the environment. The casing is of cast stainless steel, giving mechanical strength, resistance to chemical attack and a high level of electromagnetic shielding. The sensor has two high level outputs, which can directly drive cables up to 100 m long and are suitable for display and recording purposes.

Signal Interpretation

In addition to an output of mean signal level, a second sensor output is in a form suitable for further signal processing to reveal fine details of the stress wave activity in applications that require detailed analysis of the stress wave signature.

For general use, two sensors are available. A low frequency version monitors stress waves in a narrow band around 60 Hz, and the high frequency version in a narrow band around 500 kHz. Sensor signals can be directly interpreted to determine characteristics such as mean level, peak value and so on.

Alternatively, specific features of the signal can be timed, or their amplitude compared with other features. Using additional circuitry, either one of the sensor outputs can be used to operate a switch when it exceeds or falls below a particular level. This can then trigger a warning action, or instigate a control operation.



The Stresswave Technology stress wave sensing industrial evaluation kit

The stress wave sensor can be applied alongside and in a similar manner to a temperature of load sensor, for example. Stresswave Technology has carried out numerous field trials on varying industrial applications. These include condition monitoring, valve failure and leakage, process control and monitoring, dry mixing and flow monitoring.

Turbulence and cavitation in a flow produces stress wave activity. As a butterfly valve is closed, greater turbulence increases this. Hence, a simple application would be to monitor flow consistency, or detect build-up of an obstruction at a particular location. The technology can also be used to monitor the integrity of structures.

Stresswave Technology markets and industrial evaluation kit to enable users to assess the potential of the technology. This contains two general purpose sensors with full documentation.

For further information contact: Stresswave Technology Ltd., Unit 2D, Ravenstor Road, Wirksworth, Derbyshire, United Kingdom, DE4 4FY. Tel.: +44629 825454.

POSITIVE ROTARY LOBE PUMPS FOR ULTRA-HYGIENIC PROCESSES

The new Ultraclean SK range of positive rotary lobe pumps from SSP Pumps has been designed to provide the most hygienic operation available worldwide among pumps of this type. Liquids and product transfer duties in biotechnology and pharmaceuticals processing and in areas such as premium-priced foods manufacture will be possible with much greater reliance on

standard, economical cleaning-in-place (CIP) procedures.

The range incorporates a design feature that eliminates from the pumping chamber the rotor fixing nuts, splines and front cover recesses used in conventional designs. Although stainless steel rotary lobe pumps have long offered easy cleaning and hygienic operation, these pumphead components do involve potential product retaining zones and thus bacterial contamination can occur if the pumps are not dismantled frequently for manual cleaning.

The new design employs a means of rotor fixing outside the pumphead in which the rotor's integral sleeve projects through the rotor case/shaft seal and is clamped to the shaft. Drive is transmitted from the shaft to the rotor by the precision involute splines and not by the clamp.

Units compared

Cleanability within the pumphead is further enhanced by high quality machined surfaces, and an electropolished finish is an option. Pumphead design also facilitates total drain down of product before and after the cleaning sequence.

The SSP Ultraclean positive rotary lobe pump

In addition to CIP, steam cleaning up to 130°C may be applied. The choice of flushed seals provides an additional hygienic feature. Available seal options include single or double lipseals and purpose-designed mechanical seals.

The United Kingdom's Food Research Association compared this new pump with one from the United States for relative cleanability. The parameter used to establish the relative cleanability of the different areas was a microbial colony forming units per square centimetre.

The comparison indicated a value for the SK pump 60% less than that for its American counterpart. The difference was largely the result of an absence of potential product retaining areas in the SK range pump.

The range incorporates five pump series, progressing in port size from 25 to 80 mm diameter and offering displacements from 0.085 to 1.680 litres/-rev. Differential pressures up to 1.5 MPa can be accommodated.

For further information contact: SSP Pumps, Birch Road, Eastbourne, East Sussex, United Kingdom, BN23 6PQ. Tel.: +44323 25151.

TRACE HEATING FOR DIFFICULT APPLICATIONS

Jimi-Heat Ltd. has introduced a new heat-tracing system designed especially for use on pipes conveying heated liquids or slurries over long distances at process plant sites, marine terminals or fuel oil pipelines.

The system uses a new heating tape, JTLS, which is a double insulated silicon rubber heating tape with tinned copper conductors and an optional outer braid. This tape, which operates on an unusually long circuit length, can be either prefabricated at the factory or terminated on site.

The benefit of the new system is tha it reduced the number of electrica inputs required to a minimum. A 600 m long pipeline can be powered by on three-phase 415 V supply, while fo longer lengths the system can be run on a high voltage supply up to 750 V, running three traces down the pipeline a typical loadings of 20 W/m of tape. Fo intermediate areas such as tank farms, the system incorporates basic cut-to-length zone heating tapes.

An extension to the company's range of Meterheat cut-to-length heating tapes, the new FTX and FTZ cut-to-length heating cables, have both received British Approvals Service for Electrical Equipment in Flammable Atmospheres (BASEEFA) certification for flameproof applications. Both have in-built cold tails and can be cut and terminated on site with their appropriate termination kits.

The FTX range, certified by BASEEFA for type e flameproof applications, is suited for freeze protection and is available in loadings of 10 and 15 W/m with a withstand temperature range from -30°C to +90°C. The FTZ range,

The new Meterheat tapes from Jimi-Heat are supplied with an outer braid of tinned copper or stainless steel and should be used with a residual current circuit breaker.

ertified for type n flameproof applications, is best suited for process heating p to 170°C and is available in loadings f 10, 20 and 30 W/m.

Jimi-Heat also offers a full turnkey nstallation service through its associated company Jimi-Heat Contracts Ltd.

For further information contact: Jimi-Heat Ltd., Jimi-Heat House, 200 Rickmansworth Road, Watford, United Kingdom, WD1 7JS. Tel.: +44923 34477.

DEVELOPMENTS IN OPTICAL FLOWMETERS

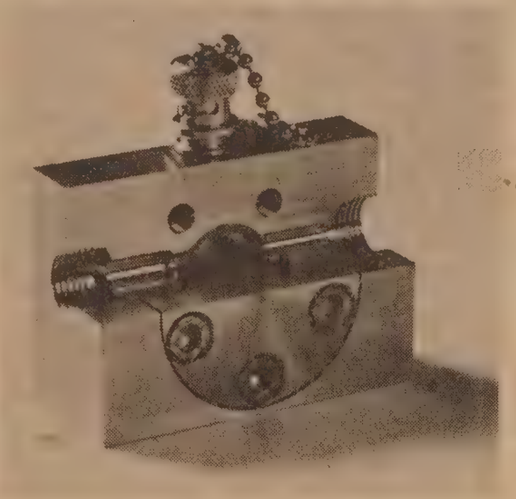
The new high pressure, 10 MPa, 125°C, Pelton Wheel turbine flowmeter from Titan Enterprises Ltd. is machined from 316 stainless steel and the turbine is supported on large sapphire bearings. The unit requires a 12 V30 mA power supply and gives a square wave pulse output proportionate to flow. Linerarity is typically ± 1.5% or better, and repeatability is ± 0.1%.

The company has also added a Hall effect to its range of flowmeters. This has opened up new markets for opaque liquids such as ink and oil/water emulsions.

The use of Hall effect sensing systems also has other significant design features. For example, the system measures from the side of the turbine rather than the periphery. This design is less expensive to produce, so that prices are up to 25% lower than those for some comparable flowmeters.

In addition, the turbine has a significantly lower mass, on average about 13% of those used in comparable flowmeters. This reduces drag and increases the life of the flowmeter.

In an application for Johnson Wax Ltd., Titan Enterprises' 200 range flowmeters form the basis of an innovative, cost-saving quality control and statistical analysis system that has saved Johnson Wax around £40,000 a year. The process involves dispensing 6.9 g of solvent-based perfume into each can of air freshener.



Cutaway of the new turbine flowmeter from Titan Enterprises, showing robust construction in 316 stainless steel.

Formerly, quality control was effected by sampling a small percentage of the total output at the end of the production process. Now, the amount of perfume dispensed into each can is precisely measured and the operator alerted immediately to any unacceptable variance in the fill. The capacity of Titan's industrial flowmeters ranges from 0.008 litre/min to 5000 litre/min. (6D789/RS).

For further information contact: Titan Enterprises Ltd., Higher Kingsbury, Milbourne Port, Sherborne, Dorset, United Kingdom, DT9 5EB. Tel.: +44963 251144.

INNOVATIVE TECHNOLOGY FOR ACETYLS COMPLEX

BP Chemicals has announced the completion and commissioning of its new acetyls complex at Hull in north-east England. The project, first announced in 1985, was completed ahead of schedule and within budget early this year. Features of the project are new process technology, the employment of pre-assembly techniques and integration of plant to make the most efficient use of feedstocks.

The new plant has a production capacity of 175,000 tonnes/year and will bring acetic acid/anhydride production capacity to Hull to about 600,000 tonnes/year when it is in full production. In the plant, acetic acid and acetic anhydride will be co-produced in the same reactor. The existing plant produces acetic acid which is used mainly to make acetic anhydride. This is not the most efficient route and the new plant makes the anhydride directly.

The first Hull plant, commissioned in 1982, employed Monsanto's acetic acid technology. In this process, carbon monoxide and methanol are treated at 4 MPa and 180°C in the presence of iodides and rhodium catalysts to produce acetic acid. Using high temperature dehydration, the acetic acid is then converted to ketene which is further reacted with acetic acid to form the anhydride.

BP acquired the worldwide rights to the Monsanto process in 1986 and modified and extended it to co-produce acetic anhydride in the same reactor. In the extended process, part of the acetic acid is recycled to an esterification unit where it reacts with some of the methanol to produce methyl acetate. The acetate then reacts with the carbon monoxide in the main reactor to form acetic anhydride. At the same time, the remaining methanol and carbon monoxide form acetic acid.

The reactor is able to produce both acid and anhydride in varying proporitons according to the feedstock ratios. The catalysts used are similar but more sophisticated.

Pre-assembled units

In traditional acetic acid manufacture the carbon monoxide feedstock is produced from methane in a steam

reformer. Hydrogen is also produced and is normally burnt as a fuel. In the new complex the hydrogen is upgraded to ammonia.

An air separation plant is included to produce the nitrogen needed to make the ammonia, and the oxygen produced is used in a partial oxidation unit, instead of a steam reformer, to make the carbon monoxide and hydrogen. For this purpose the companies Air Products and Kemira became involved.

BP owns and operates the 400 tonnes/day partial oxidation carbon monoxide plant and the 175,000 tonnes/year acetyl complex. Air Products owns and operates the air separation plant, which produces 470 tonnes/day of oxygen and 1,200 tonnes/day of nitrogen. Kemira owns the 230,000 tonnes/year ammonia plant, which is operated, however, by BP.

Extensive use of pre-assembled units (PAUs), constructed off-site and brought in by sea and road, helped to reduce the construction time. In all, 29 PAUs were fabricated, some weighing up to 600 tonnes. This allowed civil building works and other activities to proceed in parallel with mechanical works.

A distillation column on the new BP Chemicals acetic acid anhydride plant at Hull in northeast England

Davy McKee was the managing contractor. An important initiative taken by BP was the integration of the entire project under one project manager. Davy McKee and BP Chemicals integrated their teams into one unit to coordinate all stages of the operation.

For further information contact: BP Chemicals Ltd., Belgrave House, 76, Buckingham Palace Road, London, United Kingdom, SW1W OSU.

EASY- TO-FIT CARTRIDGE SEAL OFF-THE-SHELF

The Type 515C cartridge seal, based on the patented asymmetric-formed metal bellows seal, has been introduced by John Crane UK Ltd. The seal has the lowest number of components of any standard cartridge, says the company, and is designed to fit the majority of pumps without any modification to pump or seal. Significant reductions in pump downtime and more efficient maintenance are claimed for the seal, which is available off-the-shelf in 28 metric and imperial sizes.

Conventional seals require skill to fit and set, and this takes time. Cartridge seals are simple to fit and cut fitting time in half. The seal is housed in a gland plate and sleeve arrangement which is pre-set to the optimum working position. The 515C combines the benefits of cartridge design with the already successful patented bellows introduced by John Crane.

The company reviewed more than 500 pump designs to ensure that the cartridge would fit most standard process pumps without modification, including those conforming to ANSI and DNI specifications. The formed metal bellows is mounted directly on to the sleeve of the 515C cartridge. The gland plate, which contains the stationary seat and integral flush arrangements, is connected to the sleeve by a special location and drive mechanism.

The seal and seat are pre-set to the optimum working position within the cartridge. The 515C is fitted by sliding the sleeve over the pump shaft until the gland plate locates on the pump. The gland plate is fastened in place, normal flush and quench arrangements connected as appropriate, and the cartridge is ready to run.

The 515C can operate at temperatures between -40°C to 200°C and can withstand pressures up to 2 MPa. Shaft speeds can be up to 25 m/s.

John Crane's Type 515C easy-to-fit cartridge seal.

The company has also opened a new £4 million, 8360 m² factory and office which houses all the central manufacturing, warehousing, data processing, engineering, and research and development functions. It has also adopted a just-in-time supply philosophy and reorganised its manufacturing area around specialised production cells. A new stores retrieval facility has streamlined despatch methods promoting off-the-shelf service.

For further information contact: John Crane UK Ltd., Crossbow House, 40

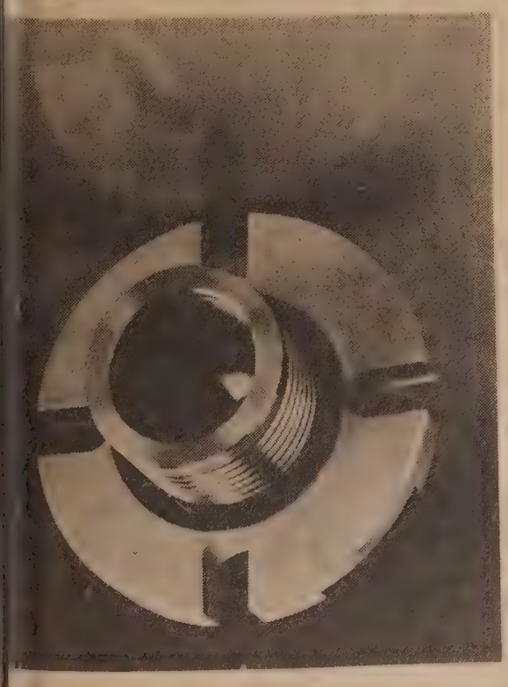
rpool Road, Slough, United King-, SL1 4XG.

VANCED CAD SYSTEM IN ACTING APPLICATIONS

he plant design management system MS) software package from CAD ntre is being used by Veritec, one of rway's leading companies, to pro-e complex, three-dimensional (3D) dels of oil rigs and related process-nt installations.

Veritec, of Oslo and Stavanger, rway, which is owned by Det Norsk ritas (DNV) and by the British design l project management firm Brown & ot Vickers Ltd. (BRV), offers a wide ge of services to the offshore indus-. In particular, the PDMS system ows the company to offer a full 3D mputer-aided draughting and design pability for design projects.

The 3D plant models produced cover pipework, electrical racking, instru-nt racking, heating and air-nditioning ducts, architectural com-nents, structural steel and service pport steel. From these models, all the nally approved construction drawings e produced.



A PDMS operator using the system's visual module.

PDMS allows the design team to produce perspective views of any part of the installation. The feature is particularly useful for design and operability reviews, for designers can see clearly the practicability of various valve and equipment arrangements within a multi-disciplinary design.

The 3D model also allows reports to be produced covering areas such as material, weight and centre-of-gravity information. In addition, a clash management software package is used to ensure the integrity of the design before fabrication drawings are produced from the 3D model.

Facilities for the production of engineering drawings include the automatic production of various types of isometric drawings as well as capabilities for the production of annotated views and realistic visualisation of the plant direct from the 3D model.

For further information contact: CAD Centre Ltd., High Cross, Madingley Road, Cambridge, United Kingdom, CB3 OHB.

HIGH SPEED BLENDING SYSTEM

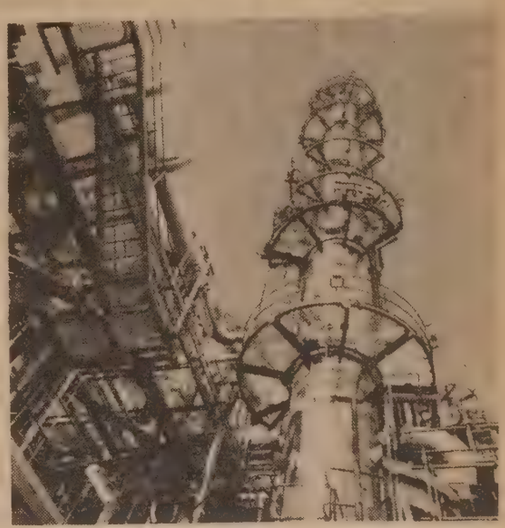
Flashblend is a continuous system developed by Silverson Machine Ltd. for the high speed entraining and instant dispersion of powders into liquid. The system comprises a feed hopper specially designed to minimise rat-holing and bridging, a high speed centrifugal pump, a Silverson high shear in-line mixer/homogeniser, auxiliary valves, probes, and a control panel fully wired to IP55, all assembled on a self-contained skid-mounted unit.

In operation, liquid is driven with immense power by the pump and passing it sucks powder through the specially designed outlet of the hopper, whence it is drawn into the high shear in-line mixer. The product that emerges in a homogenous agglomerate-free solution/dispersion.

Situated at the bottom of the powder feed hopper is a level probe which automatically closes a valve when the hopper is empty at the end of the batch, or in event of any interruption in the powder feed. This ensures that there is no aeration — other than that caused by the air entrained in the powder itself —or foaming.

The system will deliver up to 25,000 litres/h, incorporating up to 7,500 kg/h of powder, according to the product characteristics.

Construction of the hopper and all wetted parts is in stainless steel grades 321 or 316. The machine is normally fitted with totally enclosed fan-ventilated (TEFV) IP55 motors. A cleaning-in-place (CIP) bypass is incorporated for automated cleaning.



The Silverson Flashblend system for continuous in-line mixing.

Applications range from powdered milk and caseinates to gelling agents, bentonites, clays and so on.

For further information contact: Silverson Machines Ltd., Waterside, Chesham, Buckinghamshire, United Kingdom, HP5 1PQ.

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Science Briefs

ENTURE CAPITAL FIRM TO ANUFACTURE ENZYMES

A new biotechnology company has een formed for the specific purpose of anufacturing enzymes used in genetic ngineering manipulations in research nd technology. The Bangalore-based ompany, Bangalore Genei Pvt. Ltd., ill be India's first ever venture capial biotechnology company and is being et up jointly by Dr. P.S. Babu, a olecular biologist formerly with the ata Institute of Fundamental Research ombay, and Dr. K. Prasad, an NRI mmunologist.

A large part of this venture capital unding will be provided by the Techology Development and Information Company of India (TDCI), the venture capital wing of Industrial Credit and Investment Corporation of India Ltd. (ICICI) formed a couple of years ago. The Department of Biotechnology (DBT) is also keen on seeing the enzyme venture enter the successful operational phase soon.

Restriction enzymes are a special class of enzymes that enable cutting up of the large (genomic) DNA into small reproducible segments. Each of the two helical strands of the DNA is made up of sugar molecules which are attached to one of four other molecules called bases. A base on one strand pairs itself in a specific way to another base on the other strand giving the DNA its characteristic spiral stairway structure. Genes are segments of the DNA and the genetic information is contained in the ordering of bases. A particular short segment course for a particular gene depending upon the subsequence of bases therein.

There are a variety of restriction enzymes — at least a hundred are in current use — with each designed to seek a specific combination of bases and cleave it free of the remainder of the genome. Isolation of these short genetic segments of the DNA, corresponding to single genes, and their preparation in chemically pure form and in ample quantities is called cloning. Genetic manipulation with these segments, by inserting them in different host DNAs (or their parts) and then splicing, constitutes the technique of recombinant DNA which forms the basis of genetic engineering.

Problems with imported product

The amount of enzymes required for one cleaving operation will be in the region of micrograms or microlitres but their monetary value is very high. At present restriction enzymes are under Open General Licence (OGL) and can be imported by individual users. Bulk import, however, is being handled by the CSIR Centre for Biochemicals, New Delhi. Importing restriction enzymes has its own attendant problems of deterioration if they are not kept under appropriate environmental conditions.

According to Dr. Joshi, Director of the CSIR Centre, the centre has the arrangement for clearing the landed materials quickly. Bulk purchase from a single vendor helps in this as the vendor is under a contractual obligation to supply advance information on flight and freight details. Despite this advantage not every import is routed through the centre probably because of the very special requirements of the individual user which the vendors of the CSIR Centre are not able to meet.

The technology of growing enzymes has been a closely guarded one by biotechnology companies which do cloning on a large industrial scale. Published information on these is not easily available, according to Dr. Joshi, large scale production of these enzymes makes use of what is known as 'hyper-cloned phase bacteria' that are essentially organisms in which half the protein content will be an enzyme. Such large enzymes are produced in big reactors of 10-20 litre capacity. Given these various factors, an indigenous effort in this direction is certainly laudable and more so if it is launched by working scientists themselves.

Knowhow from Bangalore centre

Though details of the technology to be adopted by Bangalore Genei for the manufacture of restriction enzymes are not known, the knowhow will be obtained from Astra Research Centre (ARC), Bangalore, according to the recent issue of the Indian scientific journal Current Science. The ARC is a fully owned subsidiary of the Swedish company Astra, and was set up in 1987 with the objective of carrying out research in medical biotechnology and developing diagnostic kits for a variety of tropical diseases. It works closely with the Indian Institute of Science (IISc), Bangalore.

Initially, the Indian firm will make the more important and commonly used restriction enzymes. According to Dr. S. Ramachandran, the DBT Secretary, the company will also productionise certain strains of enzymes developed by the NRI partner. It may also attempt to produce various other strains developed by several molecular bioligists in India, he added.

There are also other proposals for biotechnology ventures which may include the field for restriction enzymes. The Bangalore-based United Breweries Ltd. is thinking in terms of joining hands with Pharmacia, another Swedish company, that has recently set up its operations in India. The DBT itself is toying with the idea of setting up a company called Indian Biotechnology Ltd. (IBL) that will involve the network of all users and agencies engaged in genetic engineering and biotechnology in its project proposal. The CSIR, in

particular, is likely to play a prominent role in realising this.

-- **The Hindu**

BIOCATALYSIS SOLVENTS: DRAMATIC DEVELOPMENTS

The use of enzymes in non-aqueous solvents marks a radical departure from traditional enzymology involving aqueous solvents and may dramatically transform the area of biocatalysis.

It is well known that enzymes have immense potential applications in a wide range of industries including chemical, petrochemical and food processing. Enzymes and industrial processes suffer from one basic incompatibility most enzymes work in water while most processes in the industries simply do not.

But the long-standing belief that practical applications of enzymes are essentially limited to water-based chemistries has recently been challenged by several independent reports of enzyme catalysis in non-aqueous solvents. Alexander Klibanov of the Massachusetts Institute of Technology, Chi-Huey Wong of Texas A & M University (both USA) and Peter Halling of Strathelyde University (UK) are among the many researchers studying the economic potential of organic solvents.

In the early 1980s, Klibanov found that enzymes need not be in water to catalyse reactions. While devising a system to produce alcohols and esters from racemic mixture, using porcine pancreatic lipase as an enzyme he found that only a thin layer of water surrounding the enzyme molecule is needed to maintain its structural integrity and function in organic solvents. What is more, in organic media, enzymes acquire important new properties —thermal stability, storage stability and substrate selectivity—that vastly improve catalytic activity.

In fact, many enzymatic reactions that are not feasible in water take place readily in organic solvents. According to Klibanov and Wong, there are several advantages of using enzymes in organic solvents instead of water.

As enzymes are insoluble in organic solvents, they need not be immobilised; and their recovery and reuse are easier. Product recovery from aqueous solution is more costly, and water can lead to unwanted side reactions, and the use of organic solvents reduces the number of steps in a reaction.

Since it is imperative that the enzyme be surrounded by water, the most useful solvents are the hydrophobic (water-hating). They will not pull water away from the enzyme. Less hydrophobic solvents will work too, as long as they are resaturated with an aqueous solution. For most enzymes, hydrophilic solvents are out of the question; there are some, however, in which the water is bound so tightly that even hydrophilic solvents cannot usurp the water. The level of the organic solvent in the system can be upto 99 per cent with water as a limited reagent.

In the anhydrous state, enzymes not only retain their catalytic activity, but have increased stability at temperatures as high as 100°C. (At 100°C in aqueous buffer, nearly all enzymes lose activity immediately). The ability to use enzymes at higher temperature widens the processing options for the enzymes.

Enzymes often exhibit marked changes in substrate, regio-and stereospecificities when placed in organic solvents. Also organic media limit the choice of substrates for enzymes; or advantage in clinical and chemical analyses.

Substrate selectivity can even benefit organic synthesis by reducing undesirable side-reactions. When converting phenols to catechols. For example, aqueous enzymes tend to oxidise the product further to quinone. In organic solvents, enzymes do not attack cat chols.

Perhaps the most intriguing aspect that some reactions which cannot b catalysed by enzymes in water can b catalysed by enzymes in organic sol vents. In organic solvents, they can cat alyse at least six other reaction including transesterification, esterifica tion, amidolysis and acyl exchange. A number of commercial applications may evolve from these new enzymatic activities.

Klibanov and Wong have already developed processes for lipase catalysed products of optically active compounds used in the manufacture of pharmaceuticals, perfumes, agrochemicals and liquid crystals. They have also used lipases (which normally breakdown fats) in organic solvents to selectively modify sugars and to synthesise peptides. Wong used lipases to make peptide precursors to penicillin G and penicillin analogs.

Interesterification of fatty acid is another example of enzyme reactions in organic solvents. Interesterified fats are of commercial interest for production of margarine and many fats. By such an approach, a cheap vegetable oil such as palm oil can be converted into an approximation of the more commercially valuable cocoa butter.

Another project that has great industrial potential is the one that is being undertaken by Peter Halling who has shown that proteases, enzymes that normally breakdown proteins and their constituent peptides from raw materials that are available cheaply. Among the possible products of proteases made to work backwards in this way are artificial sweetners and synthetic versions of the peptides which serves as natural control chemicals within the body. One of the most important applications of this approach is the plastein reaction to prepare high-molecular-weight protein polymers from partially digested pep-

es. The plastein reaction is used as a ans of incorporating methionine and tein into the structure of soy protein l improving its nutritive value. The ne principle has been used in Novo's thod for conversion of porcine insu- to human insulin and in the synthe- method developed by the Japanese mpany Toyo Soda for production of dipeptide, aspartame, an artificial eetner.

Another project that has great poten- l for extending the scope of non- ueous biocatalysis is the degradation lignin. Lignin is the second most undant organic chemical on the earth d the largest source of renewable omatic chemicals. But it is difficult to grade, chemically or biologically. igninase, an enzyme that degrades gnin, has been isolated it occurs nat- ally in fungi, but in minute quantities.

Scientists theorised that since ligni- se is a peroxidase, another peroxidase, ch as horse radish peroxidase, should so degrade lignin. It does not in water t it does in 95% dioxane. The kind f degradation is comparable to that served with the natural ligninase, and out a third of the lignin is degraded. he ability of peroxides to degrade gnin has enormous potential in utilis- g lignin and/or lignocellulose.

As the new technology of biocatal- sis in organic solvents is advanced and mbined with recombinant DNA tech- ology, which allows low-cost produc- on of virtually any enzyme, we can ok forward to an exciting era of crea- ve exploration in the development of ovel products and processes. Already number of processes based on non- queous biocatalysis are on the verge of ommercialisation.

-- PTI Science Service

HIGH RESIN CONTENT LEADS TO COAL COMBUSTION

Indian palaeobotanists have, for the first time, conclusively proved that the presence of high resin content in the coal seams of Raniganj coal fields is mainly responsible for spontaneous combustion of the fossil fuel in the area.

Petrographic studies carried out by scientists of the Birbal Sahni Institute of Palaeobotany (BSIP), Lucknow, and the Indian School of Mines, Dhanbad, have revealed the occurrence of terpene and lipid-rich resins, leading to high to moderate susceptibility to spontaneous combustion in the coal fields of Damodar Valley. The finding, based on chemical, thermal and petrographic studies on the composition of coal seams, confirm the genetic cause of spontaneous combustion in the coal fields spread in a huge area along the Damodar Valley. So far, experts have worked only on the physical factors and were unable to explain other factors responsible for the natural ignition.

Reporting their findings at a recent symposium on "Vistas in Indian Palaeobotany" in Lucknow, Rakesh Saxena, D.K.B. Navale and D. Chandra said younger coal seams in Raniganj were greatly susceptible to fires because of their high content of resins, vitrinite and other micronutrients. These resins occupy the microcrack regions of in vitrinite and associated micronutrients and provide easy access to air in reaching the internal surface of coal and causing combustion.

Spontaneous combustion of coal leads to huge wastage of the fossil fuel and can be fatal to miners. The tendency towards spontaneous combustion is highly evident in Raniganj and Jharia coalfields, the experts said, adding that the proper identification of the coal seams is important for economic conservation of the fuel in the area.

-- PTI Science Service

INDIGENOUS SOURCE OF VIRGINIAN TYPE CEDARWOOD OIL

The Regional Research Laboratory (RRL), Jammu, has extracted Virginian type cedarwood oil from Juniperus excelsa, a medium sized tree forming almost pure forests in dry temperate regions of Jammu and Kashmir, Himachal Pradesh and Uttarkhand Division of Uttar Pradesh. This work is of great interest as cedrol rich oils have until now been obtained only from J. Virginiana and J. Procera indigenous to North America and East Africa, respectively.

The raw material for obtaining essential oil consists of semi-dried terminal branches with adhering leaves. The average yield of oil through steam distillation is 1.5 per cent. The oil is of pale colour and clear consistency having a light greenwoody balsamic odour with a lasting knot of vetiver. The oil indicated the presence of more than 60 compounds, of which those occurring in larger concentration are sabinene, limonene, 1,0-menthene, limonene, 1,0 menthene, terpinen-4-ol alpha-cedrene, beta-cedrene and cedrol, which constitute 22-25% of total oil. The essential oil from J excelsa has been found to have a good scope of utilisation by perfume and flavour industries as a supplement to Virginian cedarwood oil. The oil is also a rich source of cedrol which solidifies even during distillation.

A detailed survey of raw material resources indicates availability of large quantities of the raw material from Pangi, Lahaul and Kinnaur region of Himachal Pradesh. Field trials revealed that a systematic harvest of terminal branches yield an average of 40 kg of fresh raw material per tree without causing any detrimental injury to the latter. This method of harvest actually induces a fast growth of young shoots in subsequent years. As the raw material is a renewable forest biomass, there is a great potential for commercial production of J. excelsa oil in the country.

-- PTI Science Service

RICE BRAN TO LOWER CHOLESTEROL

A new "health oil" is looming on t

horizon, which is not only claimed to be the best known yet for lowering blood cholesterol levels, but also accelerates growth, and promotes the health of the skin.

Extensive studies on rice bran oil and its various fractions at the National Institute of Nutrition (NIN), Hyderabad, and at the Central Food Technological Research Institute (CFTRI), Mysore, have shown that rice bran oil may have a better cholesterol lowering effect than any other vegetable oil.

The studies have shown that the composition of rice bran oil is very close to that of groundnut oil. Both the oils contain about 35% linoleic acid, an essential fatty acid, known to bring down the cholesterol level in the serum and liver. Further, rice bran oil possesses the highest hypocholesteremic property compared to other edible oils like safflower oil, sunflower oil, cottonseed oil, soyabean oil, sesame oil, corn oil and groundnut oil. scientists of NIN claim that rice bran oil is even better than safflower oil—until now known as the best vegetable oil for lowering serum cholesterol.

A blend of rice bran oil and safflower oil, in the ratio of 7:3, is more effective because of the combination of high linoleic acid in safflower oil and unsaponifiable fraction of the rice bran oil, according to NIN studies.

Apart from this, rice bran oil has some other advantages. The oil contains high levels of tocopherols (Vitamin E) which confer stability against oxidation to the oil. Rice bran oil is also known to decelerate ageing in human beings. It is good for maintaining the integrity of the skin and, the keeping quality of the oil is also high when compared to other oils. Foods, deep-fried in rice bran oil, absorb less oil compared with foods fried in groundnut oil.

Investigations at CFTRI, have shown that oryzanol, a compound isolated from the soap stock obtained during alkali refining of rice bran oil, is responsible for lowering cholesterol. At 0.5 per cent concentration oryzanol can significantly lower serum and liver cholesterol and serum triglyceride levels in rats fed with high-cholesterol diet.

Oryzanol possesses a higher degree of cholesterol-lowering potency than curcumin of turmeric and capsaicin of red chillies. Further, it also inhibits platelet aggregation (clustering into a mass) in blood in experimental animals. High cholesterol and triglyceride levels in blood leads to atherosclerosis and associated coronary problems. This is further aggravated by the aggregation of platelets. Since oryzanol is potentially active against all these three factors, its usefulness needs to be emphasised.

Oryzanol is a mixture of some compounds such as ferulic acid esters of campesterol and B-sitosterol. In addition to its hypocholesterolemic activity, oryzanol has many possible pharmacological uses like acceleration of growth, regulation of oestrous cycle and ability to promote skin capillary circulation as demonstrated in experimental animals. Oryzanol is also reported to have anti-itching and anti-dandruff action. It is also considered to be a good antioxidant for oils and fats. Thus, rice bran oil is endowed with many unique beneficial qualities and one may brand the oil as 'health oil' and boost its popularity.

India is emerging as a leading producer of rice bran oil in the world with an annual production at 330,000 tonnes in the financial year 1988-89, comprising 135,000 tonnes edible grade oil and 195,000 tonnes of industrial grade oil. However, to reduce the dependence on imported edible oils, the vast potential of rice bran oil has to be fully exploited. One of the major problems in producing good-quality edible-grade rice bran and oil is the presence of lipase enzyme in rice bran which causes rancidity and makes both the oil and bran unfit for human consumption. Appropriate tec nologies developed by CFTRI, Myso and other organisations for effecti stabilisation of rice bran would h boost production of edible grade oil the country.

--PTI Science Servi

SYNTHETIC WOOD SUBSTITUT

A Bulsar-based manufacturer h come out with an amazing new woo substitute - synthetic wood for the fir time in India.

Natural wood is easily damaged b heat, termites and water. It also burn cracks and splinters.

The new synthetic wood is a extruded structural foam polymer mad from PVC or polystyrene. It matches th appearance and feel of natural woo better than other wood substitutes lik aluminium, steel, and plastic.

It is strong and needs no painting polishing, treating and varnishing. A special technique is used to create var ious wood grain effects so that it look like natural wood.

The synthetic wood is rot-resistan and waterproof. It does not crack splinter, warp, twist and stain. Direc sunlight and heat do not fade its colou or alter its shape. It does not smoulde like wood and is dimensionally stabl even at high temperatures. It is stabilised against ultraviolet light, has a high resis tance to chemicals and offers good hea insulation. It is also claimed to b soundproof.

Carpenters will find it easy to work with. It can be drilled, glued, grouted nailed, routed sawn, screwed, tapped and bonded.

The product is expected to find wid use as a wood-subsititute for use in flush doors, false ceilings, cupboards, shelves showcases, kitchen cabinets, sliding doors, movable partitions, display sign

ards, photoframes and in railway aches.

It is available in 1m x 2m panels in arious thickness (6mm to 25mm) in a ariety of colours and finishes.

--PTI Science Service

IAMOND SYNTHESIS IN THE TMOSPHERE

Assoc. Prof. Yoichi Hirose of the Nippon Institute of Technology has succeeded in synthesising diamond in the tmosphere for the first time in the world.

The epochal method employed by Hirose has been called the "open atmosphere combustion flame method". By his method, gas containing carbon, of which diamond if formed, is burnt and the inner flame (reducing flame) blasted onto a substrate under optimum conditions according to a report in the journal, "Science and Technology in Japan."

In conventional diamond synthesis techniques, a reaction chamber is used to apply high temperature and pressure while maintaining a vacuum condition to exclude the external atmosphere. Hirose's method is epochal in that it enables synthesis to be formed under normal atmospheric conditions. All that is required is a burner or a torch.

The principle of the method assures synthesis over a larger area, and also holds promise of both reducing the cost of diamond synthesis and of mass production. If the method is commercialised, it can be expected to have a profound impact on industrial materials.

It was in 1955 that US researchers first succeeded in synthesizing diamond by subjecting graphite to a pressure of 20,000 atm and a temperature of 2,000°C. Since that time, researchers have successfully pursued methods of diamond synthesis with faster growth rates. The most widely employed method developed until now has been the chemical vapour depositing (CVD) method, and many experimental results of this method using a heating filament, and plasma excited by high frequency waves or microwaves, have been published.

Hirose reviewed the fundamentals of diamond synthesis methods published to date and noted that all CVD methods use plasma to decompose gases. He commenced a study of diamond synthesis by means of a flame, using plasma produced in the atmosphere only for the combustion flame. From these experiments he was able to confirm that when an inner flame of 1,500°C or hotter is blasted onto a tungsten carbide or silicon substrate heated to 600°C to 900°C, diamond particles or thin films are deposited on the substrate. Hirose succeeded in synthesizing diamond by using combustion flames combining propane with oxygen, acetylene with oxygen, methane with hydrogen, and alcohol with hydrogen.

The growth rate of diamond films is about 100 μm per hour. However, a maximum value of 200 μm per hour can be attained for a particle form, and it is anticipated that this growth rate will be raised further in the near future. Free from the restrictions of a reaction chamber, this method facilitates the synthesis of diamonds. Hirose plans to synthesise diamond soon on a substrate 5 inches in diameter.

By this method, a combustion flame containing carbon such as propane is blasted onto a substrate with a burner. Carbon radicals in the inner flame induce a chemical reaction on the surface of the substrate and gradually grow into diamond.

The diamond growth mechanism in a flame, however, is not clear. There are two kinds of flame, the bright outer flame and the whitish inner flame. The outer flame cannot be used because it exerts an oxidising action, converting carbon atom into CO_2. On the other hand, the inner flame is lacking in oxygen and combustion is therefore incomplete. Thus the inner flame, or

so-called reducing flame, contains a large number of carbon atoms and hydrocarbon radicals.

Conditions required for synthesis are not severe and the synthesis may be performed easily, and technology using combusting flame holds great promise for future commercialisation.

--PTI Science Service

NEW CERAMIC FABRICATION PROCESS FOR SUPER CONDUCTORS

Researchers at Alred University have announced the development of a ceramic fabrication process they believe will allow the mass production of superconducting fiber that wastes no electric current.

A research team at the college developed the process, which integrates superconductive material into a ceramic form.

The new technique starts with the production of a form of glass that contains superconductive crystals. The glass is then converted into a ceramic that can itself be formed into fibers. The fact that the ceramic has glass properties makes it and those fibers significantly more flexible and less brittle—and potentially usable on a mass basis, the researchers said.

"This is the first (superconductive) device which could practically be used to move electricity. We've shown here nature will let us do this, now we have to make it practical" said Dr. Robert Snyder, Professor of ceramic engineering and Director of the Institute for Ceramic Superconductivity.

Snyder said the new technique permits the mass production of superconductive fiber — a step that had eluded researchers until now.

--PTI Science Service

BIOSENSOR WATCHDOG FOR POTENT PHARMACEUTICALS

Scientists have developed biosensors that can give a warning within a few seconds of the presence of enzymes used in washing powders in the atmosphere. Biological washing powders contain proteases, enzymes which dissolve proteins, skin and lungs are made of proteins, so if workers in washing powder production plants are exposed even to minute traces of enzymes, their skin and lungs begin literally to be eaten away, says the British journal "Medical Horizons".

Housewives using such washing powders can experience minor reactions. In factories where they are made, rashes and allergies can be common and serious lung diseases have occurred. To avoid health hazards as far as possib the atmosphere in enzyme washi powder production plants is sampled regular intervals. But the tests used present take 24 hours to give results. B that time damage may have been don What is needed is a detector so sens tive that it can pick up traces of th enzymes before their levels are hig enough to represent any threat, an which can give warning in a fe seconds.

Such a system is now available through research by Dr. Rob Cumming of Teeside Polytechnic and Dr. Fred Rowell of Sunderland Polytechnic in North England. They have developed two biosensors to use as watchdog alarm systems for washing powder proteases and in the future for biologically active substances. One biosensor uses a solid, colour substance whose molecules are cut into two by the protease. One half of the cleaved molecule becomes soluble in water. So if the test is done in a damp environment a spreading colour change is seen. The other biosensor uses a soluble antibody which reacts specifically with the protease.

--PTI Science Service

NEW FILTERS FOR "SORTING OUT" LIQUIDS AND GASES

A simple and rapid method for producing high-quality polymeric mem-

anes from conventional polymeric ms, for instance the ones going into making of household bags, has been veloped by the Moscow University emists.

To separate one substance from other, one can use a membrane: the iest "sieve" with mesh size from 10 1,000 Angstroms, through which lutions are driven under pressure. ercing thin polymeric films with holes such a diameter is a very laborious, th the forces of surface tension striv- g to "shut" the hole and bring the lymer back to its initial position.

Traditional methods of producing lymeric membranes are both complex d expensive. The most popular one volves drawing the polymer through unch of charged elementary particles nich, on account of their high energy, r-out the atoms of the substance from e film surface, leaving in their place y holes in the molecular structure. eir size is controlled by etching with ids, and in this manner membranes th a present mesh size are prepared.

The new method involves preparing embranes of comparable quality by etching polymeric film in an aggres- e medium, reports APN.

While stretching a conventional pol- thylene film, a transparent "neck" fficiently strong the electron micro- ope, shows that in the "neck" region long chains of polymer molecules arranged like wool fibres in a thread, ich accounts for its much-valued chanical properties.

If the stretching is done in some gressive medium, the "neck" will be bid rather than transparent. And in the croscope one will not see an ordered lecular structure. Instead there will something resembling a sponge: pol- er ties alternating with hollows in the lecular structure.

At first, these hollows are small, and gradually become larger. Further stretching will result in a collapse the holes "shutting up"- leading to the formation of an absolutely new molecular structure.

To control the hole size in stretching, the soviet scientists use a mixture of dyes with molecules of different, but known dimensions. These may be iodine, vitamin B12 and a great many other organic and inorganic compounds. All of them are differently coloured and, by driving the mixture through the membrane, scientists can see how the solution is changing colour in the filter, like a sieve, retains the large molecules.

The filters developed by the Soviet chemists can "sort out" molecules which differ in size by only some five-six Angstroms. This corresponds to the most exacting technical requirement put today to membranes for liquid filtration.

--PTI Science Service

VEGETABLE OIL TO FUEL TOMORROW'S TRACTORS

A few years ago scientists and engineers were motivated by the oil crisis to look into the use of alternative fuels. Today they are motivated primarily by environmental problems. The use of plant-derived fuels would represent a major contribution towards reducing the pollution of our environment. Two major lines of development are currently being pursued: bioalcohol and vegetable oil. The use of ethanol or ethyl alcohol is being strongly pursued in Brazil, where alcohol is generally used as a gasoline additive.

In the Federal Republic the focus is more on vegetable oils. Since the growing of the rape plant is an old tradition in Germany, interest is focused on rapeseed oil. Unprocessed, it is slightly more viscous than diesel oil. Diesel engines will run on it as such, but it very

soon leads to heavy deposits and, eventually, to functional disturbances. If, on the other hand, the oil is "transesterified", that is, converted on the basis of an ester exchange, these problems can be eliminated. The almost clear product has the same viscosity as diesel oil and shares other important properties with it as well. It can be used to run all standard fuel-injection diesel engines, a report from Germany says. The chemical process is unproblematic: the trivalent alcohol glycerine that forms the basis of rapeseed oil is replaced by simpler alcohols such as ethanol or methanol. In the transesterification process about 11 Kg. of glycerine (a highly valuable substance) is produced per 100 Kg of rapeseed oil. As such, conversion costs should not be significant.

The use of transesterified rapeseed oil offers many advantages. It is biologically degradable and not inflammable. Transport and storage are thus unproblematic. The exhaust emissions produced are cleaner than in the case of diesel. The amount of soot produced, in particular, is significantly smaller with rapeseed oil than with diesel. Sulfur emissions are almost zero. At the Federal Research Establishment for Agriculture in Braunschweig, where the Institute of Bio-system Engineering is developing the new vegetable-based fuel, the initial objective is to introduce its use on farms. It has been estimated that enough rapeseed-oil-based fuel could be produced to replace diesel in the farm sector if rape were grown on approximately one-fifth of the available farmland.

This corresponds more or less to the amount of farmland needed in the days before motorisation to produce food for draft animals, particularly horses. There are apparently no problems with regard to reliability. Experimental tractors at the Braunschweig research establishment have run for thousands of hours on pure rapeseed oil ester without any disturbances at all. What may be t most attractive factor for the future h not even been mentioned yet: the cor bustion of this biological fuel will n result in additional carbon dioxide f the atmosphere, since the same amou of carbon dioxide is taken out of th atmosphere by new rapeseed plants the growth process.

-- PTI Science Servic

A SMALL NOVELTY IN THE FIELD OF BIO-MATERIALS

The Dutch firm CCA Biochem, G Gorinchen, Netherlands, has ju enriched the already large variety o bio-materials by devising a new bio degradable polymer; this is polyactide Compatible with the organism, i.e. lead ing neither to the rejection reaction nc to coagulation of the blood, materia such as this can be utilised, for exam ple, for operation sutures. The firm sug gests for this, a material totally differen in nature from the classical polymer used for this purpose. The material i based on lactic acid. Arising from th fermentation of glucose by microorga nisms, lactic acid is also a product o the normal metabolism of cells, report "World Scientist".

The idea of CCA Biochem was t polymerise the lactic acid in polyactid an inoffensive substance endowed wit high mechanical resistance. In th presence of humidity, as in living tis sues, polyactide has the characteristic o breaking up to give lactic acid, whic then enters into the normal metabolism In this way, suture threads are absorbe in a few weeks or months, dependin on the composition of the polyactide uti lised. This polymer being marketed i the United States can be utilised no only for suture thread, but also for plate meant for consolidating bone fractur and is even being considered for man ufacturing artificial skin. Among a other possible applications, there is th capsuling of medicines in an envelop o polyactide; the active product could thu get slowly diffused in calculated dose

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Book Review

NITROGEN-BEARING SURFACTANTS IN WESTERN EUROPE, NORTH AMERICA AND JAPAN: A Technical and Economic Assessment of Business Opportunities — Developments, Trends and Forecasts for the 90's Decade

A novel method of classifying surfactants into those 'nitrogen-bearing' and 'non-nitrogen-bearing' has been adopted by Hewin International Inc. in their report entitled "Nitrogen-bearing surfactants in Western Europe, North America and Japan", a recent addition to their series of reports on surfactant products, related chemicals and raw materials, to be issued in September 1989.

Many types of surface-active materials come under this classification, among them cationic and amphoteric compounds, alkanolamides, sarcosinates, taurates, sulphosuccinamates, amides, phosphatides and protein-based materials. Since practically all of these substances are specialities, applied in numerous products, the classification aids in the understanding of their applications and markets from a chemical point of view.

The most important of these nitrogen-based surfactants are the cationic, amphoteric and the alkanolamide surfactants, representing three different types of ionisation behaviour. The term 'cationics' comprises of a very wide array of products, such as oxygen-containing and non-oxygen-containing amines, amido-amines, the 'quats' and others. Many, but not all, have surface-active properties. They are economically the most important of the group and receive substantial attention in the report.

Cationic surfactants ionise with the positive charge on the nitrogen atom carrying fatty alkyl groups. This allows for their adsorption on negatively-charged surfaces such as human and animal hair, textile fibres, rocky aggregates, many finely divided minerals and some metal surfaces. The adsorption then confers select properties to the surface such as a traction to oily materials (asphalt on aggregates), water-repellency (mineral flotation), anti-static behaviour (hair conditioners), 'hand' (fabric softeners), etc. The cationics also confer other unique properties to substrates such as germicidal behaviour (biocides, sanitisers) and corrosion-resistance (oil-drilling, boiler feed water treatment).

The ionisation of the amphoteric surfactants depends on the pH of the system. Under acidic conditions, they ionise and behave like the cationics. Under alkaline conditions, they behave like anionics. At the iso-electric point, they form 'zwitterions', ions which have both charges on them. The most important attribute of the amphoterics is that they reduce the skin- and eye-irritability of co-present surfactants, which is taken advantage of in baby shampoos, bath products and increasingly, today, in daily-use shampoos. Seen from the point of view of industrial usage, they are stable to both acids and alkalis and they are used for their detergency properties in products such as toilet bowl cleaners and I & I cleaners.

The alkanolamides are nonionic surfactants and do not ionise in solution. Their surface active behaviour emerges from the phenomenon of hydrogen-bonding. The main contribution from alkanolamides lies in their shaping of the physical and detergency properties of the solutions which contain them as part of a surfactants-mix. These may be the conventional anionics (LABS, AES, etc.) or even cationic surfactants. They help in controlling viscosity and in synergestic boosting of system detergency.

Hewin International makes a systematic attempt to study the three classes of products and assess their quantitative dimensions, with particular attention paid to the economically important class of cationic products and surfactants. These products are first viewed as 'building blocks' — the primary, secondary and tertiary amines, — then as chemical intermediates — diamines, amine oxides, amine ethoxylates, cationic imidazolines and quarternary ammonium compounds — and finally in terms of their formulated form — as fabric softeners, corrosion-inhibitors, personal care products, detergent and cleaning formulations, biocides, organoclays, etc.

The report recognises the inter-substitutability among the products as well as the different surfactancy systems themselves and hence only attempts to present 'shapshots' of consumption patterns, true perhaps for only a short period of time. This is a welcome approach in view of the preponderance of data in future proprietary reports on the consumption of the end-products —fabric softeners, asphalt additives, etc.

Hewin International's report covers the markets of Western Europe and the United States in a more detailed manner than that of Japan, making note of the fact that in this field, at least, Japanese production and markets are comparatively modest, for example the aggregate consumption of cationics being a mere one quarter that of Western Europe, with a major portion of its cationics production dominated by a single category fabric softeners.

Hewin International Inc. estimates the following levels of consumption (1988) of the building-blocks in two major regions:

Unit: Tonnes

	United States	Western Europe
Primary amines	34.000	24.000
Secondary amines	20.000	15.000

Tertiary amines	97.000	85.000
Amido amines	48.500	28.500
	199.500	152.500

One of the important 'snapshots', which Hewin International provides is of the pattern of consumption of chemical intermediates derived from building-block amines. This is demonstrated in the table below and in figure 1 for two of the main regions of the report:

Unit: Tonnes

	United States	Western Europe
Diamines	12.000	6.000
Ethoxylated amines	34.500	28.000
Amine oxides	26.000	4.500
Cationic imidazolines	11.000	2.000
Quarternary amm. salts	131.500	103.500
	215.000	144.000

Where do all of these go? Hewin International's report covers 12 application segments in considerable detail,- Figure 2 provides a substantial answer to the United States and Western European markets, whose aggregate annual volumes of consumption are estimated at 296.500 tonnes and 205.500 tonnes, respectively. The data presented here pertains not only to the cationics but to the other nitrogen-based surfactants as well. Except in the case of the petroleum, ore flotation and personal care industries, where the consumption levels are markedly different for the two regions, there is otherwise comparable consumption.

The wide and large-scale usage of anionic (LAS, AES, AS) and nonionic (AE, NPE) surfactants, particularly in house-hold detergents and cleaners, usually masks and obscures the importance of the cationics and amphoterics seen in terms of value. Thus, although this group volumetrically contributes only to 10-12% of all surfactants in use, it is often overlooked that, value-wise, their contribution is substantial at 25-30%.

Translated into dollars, the American market is close to $600 million. That is not all. The cationics have also show a sustained compounded growth rate o some 3.2% per year (USA) for the pa several years, in marked contrast to th slow pace of growth of the anionics an nonionics (below 1% in the Unite States). US statistics indeed reveals tha 1987 consumption of cationics was 13% higher than in 1986.

Amphoteric surfactants do not show the growth rate of the cationics, perhaps by reason of their higher prices. However, in the case of alkanolamides, Hewin International finds a sea change in their consumption — they have grown some threefold in the past four years (USA data being used for illustration) while their unit prices have dropped to a fourth that prevailing a few years ago. Hewin International Inc. ascribes the increase to their greater consumption in hair conditioners (a fast-rising market) and in textile processing.

Hewin International's forecast horizon is given from the 1990's decade, with basic estimates presented for 1988. A higher rate of growth is forecast for Europe (near 4%, compound) than for the United States (near 3%). The lower US rate is ascribed to the decline of the ore flotation (mainly phosphates) and oil drilling industries.

Akzo is seen as the largest producer of amines world-wide (6 locations) with an approx. capacity of 125.000 tonnes, followed in size by Sherex with an estimated total capacity of 65.000 tonnes.

The nitrogen-based surfactants industry relies on both oleochemicals and petrochemicals, with considerable scope for interchangeability. Hewin International Inc. finds that dependence on petrochemicals (e.g. for amine ethoxylates) is going to be expensive with the petrochemical industry operating at or above capacity. At the same time, a higher reliance on alpha olefins for tertiary amines is predicted. On the other hand, oleochemical routes are particu-

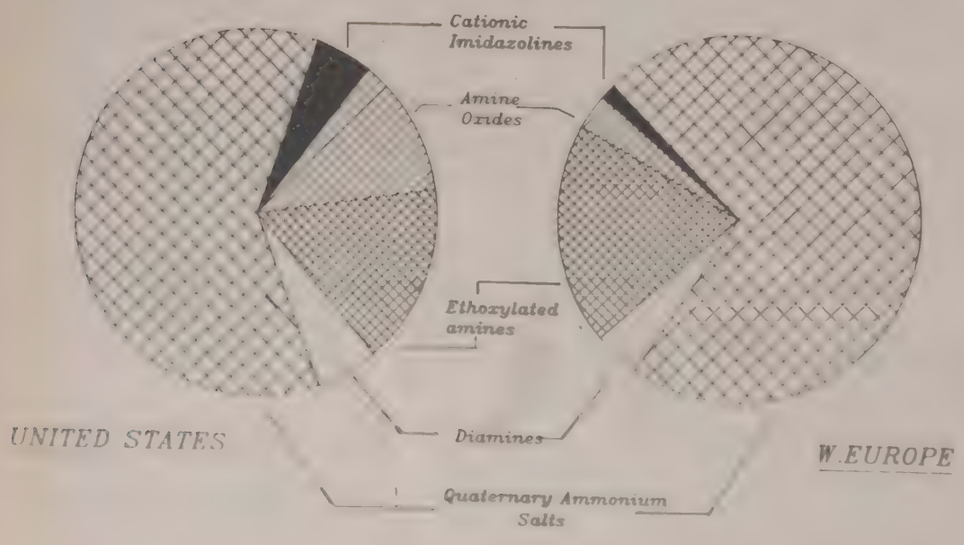

Fig. 1. Consumption patterns for major amine derivatives: 1988

rly attractive because of the world end to "natural-based" products and e factor that the raw material sources – animal and vegetable fats — are enewable and hence oleochemical rices and operating capacities are at ore modest levels i.e. that product categories such as the amphoterics and kanolamides, and many cationics, will ontinue to maintain their market shares.

Relative to environment and product oxicity issues, Hewin International nds that all is not clear in the field of ationics whose volume of consumption large enough to attract legislative tention. The cationics biodegrade aerbically but not to the extent of the anionic and nonionic detergents. However, acterial sludge from aeration vessels do ot degrade anaerobically. Cationics ow a certain degree of toxicity to fish ut the large excess of 'anionics' in the quatic environment (which provides r the formation of nontoxic comexes) ameliorates the seriousness of e problem.

The report of almost 350 single-aced pages, illustrated and supported nearly 250 tables and charts, many which list volumes and values of arkets until the end of the 1990's, completed during the third quarter of 1989, can be obtained for a pre-release price of US $3,250.00 prior to September 30, 1989, after which the price will be US $4,000.00.

Interested companies may subscribe to the confidential study. A detailed informative prospectus is available free. This study is the tenth report as part of Hewin's Oleotechnological-Commercial Development Programme to survey existing markets and to identify new business opportunities.

The first nine reports, already issued and still available, are entitled:
— An Economic and Technological Assessment of the world's fatty acid industry
— Fatty amines: Processes, Economics & Markets
— Industrial Cationic & Amphoteric Surfactants and Amides
— Edible Fats & Oils
— Biotechnology in Surfactants Production: Novel practices and their growth potential
— An economic and technological assessment of the world's oleochemical industry
— The impact of biotechnology on the oils & fats industry
— Industrial and institutional surfactants in Western Europe and North America
— The world's detergent alcohol ind.

Future oleochemical and related titles will include:
— Synthetic versus natural waxes
— Speciality & unconventional surfactants
— Household & personal care surfactants
— Fatty esters
— Agricultural surfactants & adjuvants
— Detergent raw materials
— Natural versus synthetic amphipaths.

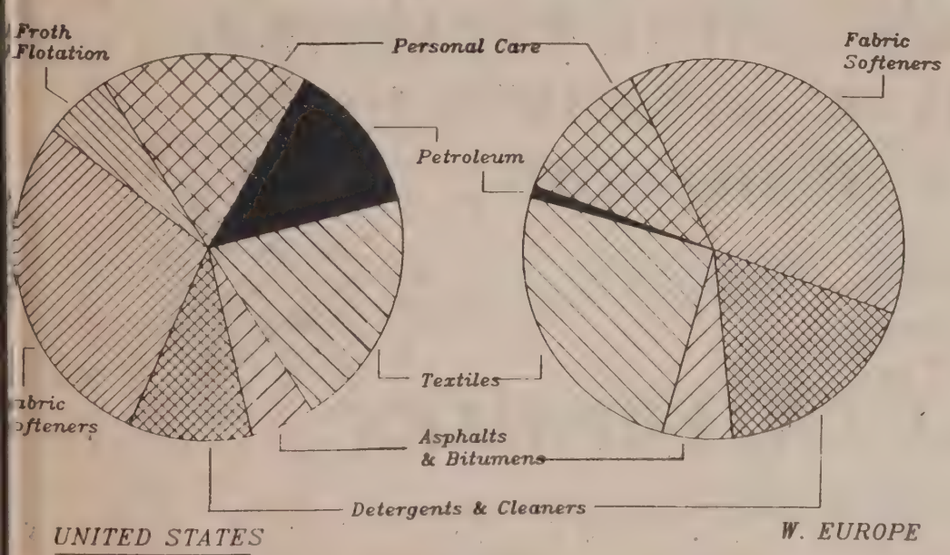

Fig. 2. Major uses of nitrogen-bearing surfactants: 1988

BIRMINGHAM CHAMBER TRADE MISSION COMING

A British trade mission organised by the Birmingham Chamber of Commerce will visit India from 2-10 Oct. This will be the Chamber's eighth mission to India, the last being in 1988. The members of the current mission (which will visit New Delhi and Bombay, with individual members travelling to other cities as well) represent a cross-section of suppliers to the office, manufacturing and construction industries, including a company claiming to be Europe's largest security organisation.

Products and services offered by mission-members include security training, security and fire-alarm services, office equipment, air and gas compressors, pneumatic equipment, construction plant, air filtration, polyethylene pipe systems for gas and water, new and reconditioned machinery for ceramics manufacture, adhesives for shoe-making and other industrial uses, and solvents, oils, fats, waxes and allied raw materials. The delegation will meet the Indian businessmen and industrialists and explore the possibilities of further strengthening trade ties. During its last mission in 1988 the Chamber signed a protocol agreement with the PHD Chamber and a Memorandum of Understanding with the Bengal Chamber of Commerce.

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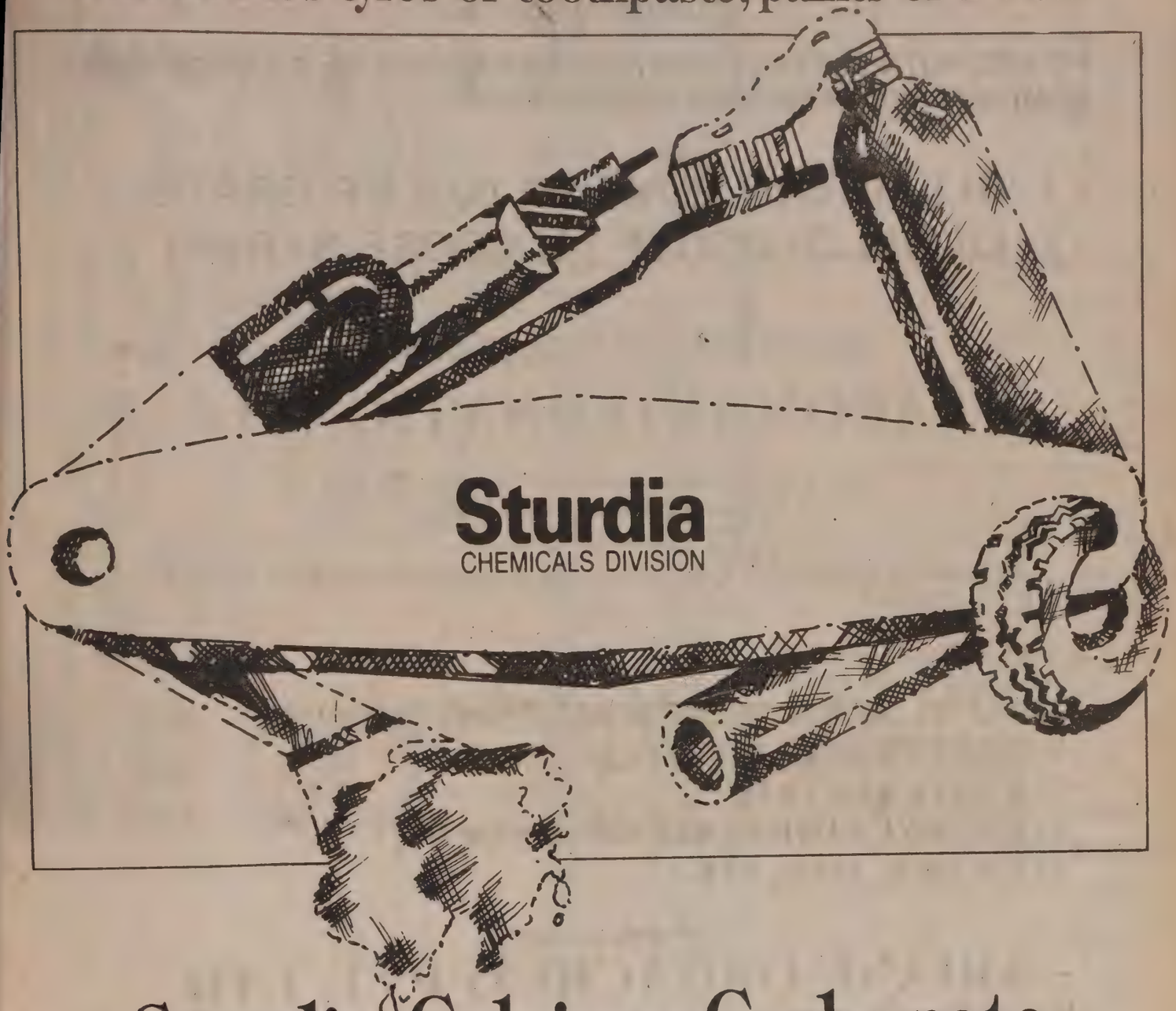

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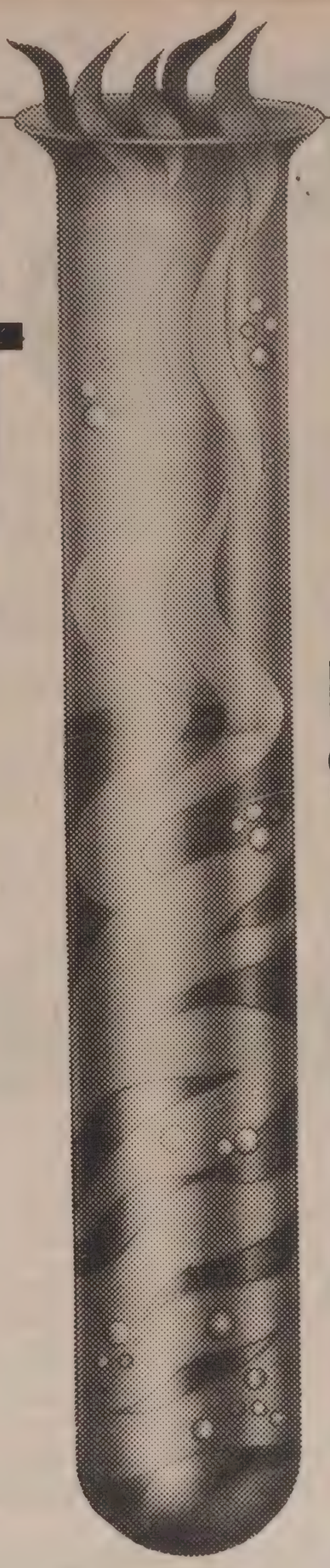

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News From Japan

HEMICAL IMPORTS XPAND IN THIS YEAR'S IRST HALF

The Finance Ministry has gathered statistics concerning exports and imports in the first alf of 1989. According to these atistics, chemical-product imorts far exceeded the Yen 1illion level and amounted to en 1,105,604 million or a 0.4% increase in comparison ith the corresponding period f the previous year. This is beause medicines, organic comounds and plastics recorded ouble-digit increases by the ne same comparison. As a reult, such items as "food", "crue oil" and "machinery and equpment" ranked among this eld's Big 5. Also, the trade balnce showed an excess of imorts over exports amounting to en 117,063 million.

According to figures gathered y the ministry, all imports comined increased by 16.3% to rech Yen 13,521,713 million. Of he Big 5, "food" increased by 1.5% to Yen 2,000,461 million; raw materials", by 15.9% to en 1,161,959 million; "crude il", by 1.6% to Yen 1,353,325 illion; and "machinery and quipment", by 19.5% to Yen ,981,026 million. In addition chemical products" increased y 20.4% to Yen 1,105,604 milon. All of the three items, hich comprise chemical proucts, recorded double-digit inreases. Medicines increased by 5.4% to Yen 188,042 million; rganic compounds by 14.6% Yen 325,813 million; and plasics, by 22.1% to Yen 114,089 illion. Regionally, too, imports ecorded a balanced increase. mports from the United States 67,176 million; those from the increased by 17.9% to Yen EC, by 10.2% to Yen 158,420 million; and those from Southeast Asia, by 18.1% to Yen 470,557 million.

As for the export / import balance, which become a problem in connection with trade friction, chemical - product exports increased by only 14.0% to Yen 988,541 million and, as a result there was an excess of imports over exports amounting to Yen 117,063 million. All exports combined increased by 12.9% to Yen 17,926,803 million. The country's foreign trade as a whole recorded an excess of exports over imports amounting to Yen 4,424,090 million. This indicates that chemical products played an important role in reducing trade friction.

According to the Finance Ministry, the Big 5 in the field of imports are increasing smoothly, with the exception of "crude oil" which volumewise increased by only 4.1% to 101,563,000 kilolitres. The ministry thinks this trend will continue for some time to come.

PRICE NEGOTIATIONS IN OFFING FOR POLYOLEFINS

In response to price hikes for raw-material naphtha and ethylene, domestic joint sales companies for versatile resins are scheduled to raise their product prices from late August thru September.

As a first step they plan to enter into negotiations with users in a bid to increase polypropylene (PP) prices by Yen 10/kg. The supply-and-demand situation concerned has been tight and market prices for raw material propylene are continuing to rise.

Those handling ldPE and hdPE also envision raising product prices this fall so that they can pass increases in raw-material costs onto market prices for the two products.

In Japan, polyolefin prices have been stabilised and are lower than those in the United States and Europe, though Japanese demand for petrochemicals has grown over the past one year and their supply has been tight. Domestic polyolefin suppliers have shelved price boosts since the year before last in an effort to stabilize the domestic market concerned.

Japanese demand for polyolefin has smoothly expanded for use in automobiles, household electrical appliances and packaging materials and is expected to remain brisk during this year.

On the other hand, raw-material naphtha prices rose last February, thereby boosting market prices for ethylene and propylene in the January-March and April-June periods. Ethylene prices for the latter period stood at Yen 98.6/kg. up Yen 7.4 kg. over the preceding term.

JAPAN'S INDUSTRIAL OUTPUT IN JUNE REVISED UPWARD

Production at Japan's mines and factories rose an unadjusted 7.8% in June from the same month a year earlier and 2% on a seasonally adjusted basis from May, both higher than projected earlier, the government said.

The revised data compare with preliminary increases of 7.3% from a year ago and 1.5% from the month before, the Ministry of International Trade and Industry said.

The revision, which puts the production index at 121.2 for June against a base of 100 for 1985, reflects surges in the pro-

duction of whisky, sake, medicines and processed lumber, categories not tallied in a preliminary report, ministry officials said.

June's performance was bolstered by robust output in almost all industries amid strong domestic demand, with the single exception being the precision instrument sector, where production slipped 3.9% from May because of sluggishness in sales of battery-driven watches.

Shipments grew a revised 8.0% from a year earlier on an unadjusted basis and a revised 2.3% on an adjusted basis, compared with preliminary increases of 7.5 and 1.8%, the ministry said.

The shipment index stood at 122.1 against 100 for 1985.

Inventories posted an unadjusted 8.7% increase from the year-earlier level and an adjusted 1.3% from the prior month, leaving the inventory index at 106.7 for the month, also against 100 for 1985.

The figures were revised downward from an unadjusted year-to-year rise of 8.8% and an adjusted month-to-month gain of 1.4% reported on a preliminary basis.

"Considering a still low level of inventories, manufacturers are likely to boost production to build up inventories in anticipation of brisk demand ahead", one of the officials noted.

SHOWA DENKO TO INVEST HUGE FUNDS IN PETROCHEMICAL BUSINESS

Showa Denko K.K. is scheduled to invest during this year a total of Yen 30 billion in plant and equipment on a construction basis. In this year's first half the company already appropriated Yen 12 billion to debottlenecking of its No. 1 ethylene plant and resumption of operation of ldPE/hdPE production facilities; they are all located on the site of the company's Oita factory.

As a result, petrochemical business accounted for 45% of the company's combined sales attained in the January — June period of this year. Petrochemical sales in the same term increased by a little over Yen 18 billion and profits obtained therefrom occupied roughly 60% of the company's combined profits.

In the latter half of this year, the rest of the investment funds will also be mainly earmarked for the build-up of olefin/polyolefin operations. The company plans to debottleneck its No. 2 ethylene plant, thereby establishing next summer a 730,000-t/y production system for ethylene. What is more, it intends to resume operation of a 25,000-t/y LDPE plant.

In response to brisk demand for petrochemicals, Japanese petrochemical companies are pushing forward large-scale plant-and-equipment investment and Showa Denko will also continue capital spending aimed at consolidating petrochemical operations.

MITSUBISHI KASEI TO MANUFACTURE PTA

As part of the diversification program for its terephthalic-acid business, Mitsubishi Kasei Corporation has decided that, of the two terephthalic-acid plants at the Matsuyama factory (Ehime Prefecture) of Matusyama Kasei Ltd., it will convert one 100,000-t/y terephthalic-acid plant from QTA (medium-purity terephthalic acid) to PTA (high-purity terephthalic acid) and has started work on th plant with completion schedul ed for the end of this yea Matsuyama Kasei Ltd., is sche duled to be merged with Mitsu bishi Kasei on October 1.

As a result, Mitsubishi Kasei' terephthalic acid business wil cover DMT (dimethyl tereph thalate), QTA and PTA so tha it will be also to render com prehensive service to its users.

TAKEDA CHEMICAL TO ADD SPECIALTY ISOCYANATES

Takeda Chemical Industries, Ltd. plans to double production capacity for inhouse-developed xylene diisocyanate (XDI) and H_6 XDI by building a 1,200-t/y plant at its Kashima factory. Construction of the new plant has already been inaugurated and its completion is scheduled for next July. A 600-t/y plant now in operation will be scrapped once the new plant has been completed.

The new plant will produce XDI and H_6 XDI in the ratio of 9:1. The company intends to aggressively export both of them in the form of monomer and prepolymer.

BDI and H_6 XDI—raw materials for polyurethane—are characterized by antiyellowing properties, compatibility with metal, weather resistance and quick drying.

Demand for the two products is expected to attain high growth for use in paints for plastics and primers for construction material, reflecting increasing demand for antiyellowing resins. The company has received enquiries from U.S., European and Taiwanese users of long-term supplies of the products.

New Developments From Japan

UPPLY OF MOLDED NTERCONNECTION EVICES IN OFFING: MITSUBISHI

Mitsubishi Gas Chemical Co. has launched into joint development of molded interconnection devices (MIDs) in partnership with a few electronics makers. MIDs are cubic injection moldings on which 3-dimensional electronic circuits are formed.

The company has already pioneered MID technology by combining precision injection-molding and printed circuit techniques. The new technology incorporates a semi-additive process capable of forming circuit patterns on injection moldings and conducting electroless plating upon the circuit patterns. It is possible to form 0.5-mm diameter through-holes and circuit-pattern lines as narrow as 0.1mm using the semi-additive process.

The MID technology has resulted from development of chemicals/heat resistant engineering plastic which facilitate chemical plating on injection moldings. It eliminates a pre-impregnation process for epoxy resin—which is included in conventional circuit-forming processes—thereby markedly reducing production costs for printed-circuit products. It enables manufacture of injection moldings having through-holes and 3-dimensional circuit patterns.

It can be applied to polyether imide (PEI), polyphenylene sulfide and liquid-crystal polymer, etc. PEI substrates produced using the MID process have the following main properties: glass-transition temperature, 215°C; coefficient of linear expansion 25—32X10-^{6}mm/mm/centigrade degree; dielectric dissipation factor, 0.002; volume resistivity, 10^{7-9} M ohms. cm bending modulus, $56X10^{3}$ kg/cm^{2}; water-absorbing ratio, 0.2%; peel resistance of copper foil, 1.5—1.8kg/cm.

In a related development, the company recently concluded a technical co-operation contract with Mini-Pac Technologies (U.S.), which commands roughly 50% of the U.S. market for MIDs.

In Japan, Polyplastics and Mitsui Petrochemical Industries have embarked on MID operations and Mitsubishi Gas Chemical envisions commercializing the products on a full scale within one or two years.

NEW POLYMER ALLOY ENSURES PRIMERLESS COATING FOR CARS

Showa Denko K.K. has developed a coating-grade product of nylon 66/speciality polypropylene (PP) polymer alloy (trade name: Systemer-S) and begun to exploit demand areas for the new product. A potential application for it is wheel caps for automobiles.

The company claims that the product is capable of eliminating primer, which accounts for a considerable share of the cost of car-manufacturing processes.

It envisions replacing Noryl-GTX (modified PPE/nylon alloy) with the new-grade polymer alloy: Noryl-GTX is extensively used for car parts for exterior use. The new product is equal to Noryl resin with respect to several physical properties.

"Systemer-S" has low-level water- absorption properties, high-level mechanical strength and strong resistance against oil and chemicals — potassium chloride (used as snow-melting agent) in particular.

The company has marketed the product since last February with emphasis placed on application to exterior-use car parts. As a matter of fact, domestic truck makers have employed the product for use in relay cases for large-sized trucks since last June.

The main physical properties of the new-grade polymer alloy are: tensile strength, 480 kg./cm^{2}; flexural modulus, 20t/cm^{2}; Izod value, 8 kg./cm; shrinkage, 1.91-2.58%; thermal deformation temperature (load: 4.6 kg.), 195°C.

SOLVAY TO SET UP DRUG LAB IN JAPAN IN MID-1990s

Solvay—a leading Belgian chemical company—is scheduled to establish a laboratory in Japan in the mid-1990s for basic drug research. Details including the investment funds and laboratory size concerned have yet to be decided on.

The planned laboratory will tackle biotechnology research, which has materially advanced in Japan: it will serve as one of Solvay's main research arms, coming next in importance to those located in the United States and Europe.

In a bid to step up drug operations in Japan, the Belgian company established last March a 51/49 joint company in partnership with Meiji Seika Kaisha, Ltd. The joint company aims at developing two types of new drugs.

Drugs accounted for 12% of Solvay's combined sales of roughly Y880 billion attained in 1988. They are high-growth commodities for the company, which is, therefore, striving to build up drug operations.

Solvay group firms are promoting in W. Germany development of new drugs acting on the digestive/immune system, pioneering in the Netherlands those acting on the central nervous/respiratory systems and conducting in the United States clinical tests on new drugs and research on drug preparations.

NEW JAPANESE-MADE INHALATION ANAESTHETIC MAY BE PRODUCED SOON

Manufacturing approval may be granted this fall (at earliest) for a new-type fluorine-based inhalation anaesthetic dubbed "Sevoflurane" jointly developed by Central Glass Co. and Maruishi Pharmaceutical Co.

The two will be the first Japanese companies to commercially develop this new-type anesthetic. Maruishi obtained manufacturing rights for the agent from Baxter of the U.S. and has carried out its pharmacological and clinical tests, while Central Glass has been successful in manufacturing it using its fluorination technology.

The agent has been highly rated by the hospitals conducting its clinical testing. It will also be first drug for Central Glass to produce. The company has been attempting to diversify into the drug field by means of its fluorination, organic synthesis and biological technology.

SCIENTISTS DISCOVER NEW CANCER-CAUSING AGENT

Scientists at the Research Institute for Nuclear Medicine and Biology in Hiroshima University said they have discovered a new gene fragment that may provide new clues about the cause of cancer.

K. Hamada, head of the research team, said scientists have found a cancer-causing agent, nicknamed U5, in mice cells. The team hopes to explain in coming months how U5 transforms health cells into cancerous ones.

He said the team made its finding in test-tube experiments.

Cancer-causing agents are classified into two groups: viruses and DNA (deoxyribonucleic acid) damaging agents, such as chemicals and radiation.

The research team first identified the transformation of small molecules of ribonucleic acid (RNA) in chemically induced tumorous cells of a mouse. Then they extracted a fragment of RNA from the mouse and injected it into the white blood cells of a rat, resulting in the cells becoming cancerous, after three to four weeks.

The scientists discovered that the small RNA molecule U5 transformed the rat cells into cancerous ones.

Hamada's paper on the U5 RNAs will be published in the October issue of the Molecular and cellular Biology Scientific Journal in the United States.

NITRIC ACID PRODUCTION IN FY88 SETS RECORD

Nitric-acid production in the 1988 fertilizer year reached the 600,000-ton level for the first time, hitting an all-time high, because—reflecting the favorable state of the domestic economy—nitric acid for tolylene-diisocyanate (TDI; raw material for urethane) use, dye-intermediates use and nitrobenzene use showed doubledigit increases. As a result, nitric-acid production topped the 600,000-ton level, exceeding the 580,000 tons recorded in each of the 1972, 1973 and 1979 fertilizer years.

According to Ammonia Derivatives Society, nitric-acid production in the 1988 fertilizer year (in terms of 98%) registered 607,444 tons (7.1% rise over previous year) owing to an increase in domestic demand. In particular, urethane production was brisk, so nitric acid for TDI use showed a doubledigit increase.

Concerning nitric-acid consumption by use, TDI use recorded 65,680 tons (16.2% rise over preciding year), followed by adipic-acid use with 61,566 ton (0.7% drop), synthetic-fiber use with 40,316 tons (0.9% decline), dyeintermediate use with 30,991 tons (18.7% gain), pigments use with 5,490 tons (28.4% rise), acid-wash-gilding use with 39,318 tons (8.3% increase), explosives use with 13,448 tons (2.5% rise), nitrobenzene use with 44,076 tons (30.9% gain) and other uses with 150,251 tons (3.0% rise). Exports registered 4,485 tons, double the figure of the previous year.

CHEMICAL WEEKLY
SUPPLEMENT ON
LEATHER PROCESSING

Microbial Degradation of Environmental Pollutants

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Large amounts of complex organic molecules are synthesized naturally every year. Such molecules have been degraded by microbial enzymes and the time required for total degradation varies considerably. In addition to these naturally formed molecules, a number of synthetic chemicals are present in water, soil and in air. They come from industrial and agricultural wastes. Some of these compounds are toxic or may become toxic.

In response to public and Government concern, environmental scientists, biologists and chemists have been giving increased attention to identifying and determining the behaviour and fate of the organic compounds in natural ecosystems. Several types of abiotic mechanisms for chemical changes are known. Biodegradation sequences, however, are capable of bringing about major changes in the structure of the introduced chemicals.

The most important environmental pollutants to be controlled are hydrocarbons. They are predominantly prevalent in the environment and are extremely stable and persistent. Much of the work on the degradation of aromatic hydrocarbons has been carried out using the bacterial genus **Pseudomonas. Pseudomonas** species are probably the most biochemically versatile group of bacteria, much of this property being due to the possession of various types of plasmids. In aromatic hydrocarbon degradation, the first sequence of reactions carried out is usually the removal of any side chain although there are exceptions.

Once the side chain has been removed, the next requirement is for hydroxylation of the aromatic ring. This is carried out by a group of enzymes known as oxygenases which occur at a number of points in the degradative pathways and can be split into two types. The monooxygenase enzymes add one atom of oxygen to a substrate molecule and reduce the second atom of oxygen to water by means of a reduced enzymic cofactor. The second group of oxygenases are the dioxygenases which add two atoms of oxygen to a substrate molecule and do not utilize a reduced coenzyme with a concomitant formation of water. An example of this is the dihydroxylation of benzoic acid to catechol and the other, cleavage of catechol to give cis-cis muconic acid.

It can be seen that the same compounds may be subjected to different pathways in different organisms. Again there are evidences that in certain cases catechol may be cleaved by either pathway in the same organism (Murray, K. and Williams, P.A., 1974, *J. Bacteriol.* **117,** 1153). Davies and Evans (Davies, J.I and Evans, W.C., 1964. *Biochem. J.*,91, 251) showed that one strain of **Pseudomonas putida** could split catechol derived from benzoate by the ortho pathway whereas catechol derived from naphthalene would be split by the meta route.

Microbial enzymes catalysing these degradative pathways are highly specific. The breakdown of benzoic acid and p-hydroxybenzoic acid is catalyzed by different enzymes until they reach the common intermediate α-Keto adipic acid. The study of aromatic degradation shows that the breakdown of many of these compounds is subject to tightly controlled regulations. This control can take place by means of enzyme induction and enzyme repression.

Organisms known to be capable of degrading the aromatic ring in addition to **pseudomonas** include a number of bacteria such as **Achromobacter, Bacillus, Arthrobacter, Methylobacterium,** while amongst the fungi **Penicillium, Aspergillus, Fusarium, Phenerochaete** are frequently reported. In most of the cases, the degradation pathways coded for have been shown to be salicylate, m and p-toluate, toluene and xylene, naphthalene and octane.

Besides these aromatic hydrocarbons mentioned above some other undesirable chlorinated hydrocarbons occur in the environment because they are introduced deliberately as pesticides, herbicides, fungicide or may arise by chlorination of water to destroy pathogens. These are 2,4-dichlorophenoxyacetic acid, 2-4-5-trichlorophenoxyacetic acid, DDT and its derivatives such as DDD, DDE, Lindane (BHC), Aldrin, polychlorinated biphenyl (PCB). All these chlorinated hydrocarbons are prevalent in the environment because of their wide use and persistance. DDT has an environmental half life of ten years or more while DDE can persist for decades. PCBs are very stable at temperatures upto 800° C, resistant to acids, bases, oxidants. Stability of these compounds depends on the presence of one or more halogen atoms in the aromatic ring which reduces biodegradability (Dagley,S., 1976. *Biochem. Soc. Trans.* **4,** 455).

Removal of the halogen group may take place by means of several routes. Reductive dehalogenation (Kearnuy,P.C., Kaukfmann, D.D. and Beall, M.L., 1964. *Biochem. Biophys. Res. Common.*, **14,** 29) can take place in an anaerobic environment and hydrolysis and dehydrodehalogenation to form an olefin is also known. Research extremely relevant to this topic has already been published (Senior, E., Bull,A.T. and Slater,J.H. 1976. *Nature*, **263,** 476). A large number of bacterial species could utilize these types of hydrocarbons among which **Pseudomonas, Archromobacteri, Alcaligenes, Arthrobacter** sp. are important. **Pseudomonas cepasia** could utilize 2-4, 5-T as a sole carbon source. Conversion of PCB to chlorobenzoic acid is very common in **Achromobacter, Arthrobacter** and **Alcaigenes** species.

Other hydrocarbons of heterocyclic ring system such as pyrrole, furan, thiophen, pyridine derivatives are also found in many industrial effluents. Reports are now available on biodegradation of these compounds (Callely,A.G., In:B. Spencer,ed. Industrial aspects of Biochemistry Fed. European *Biochem. Soc.*, 1974. p. 515 and Trudgill, P.W., 1976. *Biochem. Soc. Trans.*, **4,** 458).

In the petroleum and oil industry n-alkanes is the major component released. Large number of microorganisms are known as oil degraders of which **Pseudomonas, Bacillus, Achromabacter, Micrococous** are well known and can degrade n-alkanes of oil. Enzyme systems in **Pseudomonas,** oxidising the alkanes to alcohol, alcohol to aldehyde an the aldehyde to corresponding fatty acid is well studied (Gholson,r.K., Baptist, J.N. and M.J. Coon, 1963. *Biochemistry*, **2,** 1155; Vander Linder, A.C., and Huybregtse,R., 1969. *Ant. Van Leeuwenhoek*, **35,** 344 and Heydeman, M.T. and Azoulay, E. 10. *Biochem. Biophys. Acta*, **77,** 545). A number of fungi oxidise n-alkanes, the most important group being the Candida which could convert alkanes to corresponding alcohols and aldehyde (Iizuka,H., Iida, M. and Toyoda, S., 1966. *Z. Aligen. Microbial.* **6,** 335).

Biodegradation of polynuclear aromatic hydrocarbons h been extensively studied in view of the potential carcin genicity of the parent molucules or their degradation p ducts. Naphthalene is the simplest homolog in the polycyc series. Others are anthracene, 3-4-benzpyren 7-12-dimethylbenz [a] anthracene, 7-methylbenz [a] anthr cene 7 hydroxy-methylbenz anthracene etc. Organism responsible for degrading these compounds are **Pseudom nas.** Among fungi **Cunninghamella elogans, Penicillium notatum** could metabolise 7-methylbenz [a] anthracene an 7-12-dimethylbenz [a] anthracene respectively. Cytochrom P 450 system of many fungi and bacteria are involved i detoxification of these hydrocarbons.

In addition to these chemical componds some metals and metalloids are found to be toxic and have important roles for producing environmental pollution. In Table 1 are listed some of the metals known to undergo biotransformations. The transformations appear to be detoxification mechanisms and the capacity to perform these transformations is fairly widespread amongst microorganisms.

Table 1: Microbial transformation of metals and metalloids

Transformation	Metals	Microorganisms
Oxidation	As (III)	Pseudomonas, Acinatobacter, Alcaligenes
	Sb (III)	Stibiobacter
	Cu (I)	Thiobacillus
	Fe (II)	Thiobacillus
Reduction	As (V)	Chlorella
	Hg (II)	Pseudomonas, Escherichia, Staphylococcus, Aspergillus
	Se (IV)	Corynebacterium, Streptococcus
	Te (V)	Salmonella, Shigella, Pseudomonas
Methylation	As (V)	Aspergillus, Mucor, Fusarium, Paecilomyces
	Pb (IV)	Pseudomonas, Aeromonas
	Cd (II)	Pseudomonas
	Te (IV)	Pseudomonas
	Se (IV)	Pseudomonas, Aspergillus, Candida, Cephalosporium, Penicillium
	Sn (II)	Pseudomonas
	Hg (II)	Bacillus, Clostridium, Methanogens, Aspergillus, Neurospora

Besides hydrocarbons and metals, some organophosphate sulphate which are used as pesticides or herbicides are own to be degraded by microorganisms, such as **Pseudo-nas diminuta** hydrolyse parathion (Serdar, C.M., Gibson, T., Munnecke, D.M. and Lancaster, J.H., 1982. *Appl. Envi-. Microbiol*,**44,** 246) and **P.Putida** convert 2-ethyl sul-e to 2-4-dichlorophenoxyethanol (Lillis, V., Dodson, K.S., nite, G.F. and Payne, W.J., 1983. *Appl. Environ. Micro-l.* **46,** 988).

Some other environmental pollutants such as CO, CO_2, O_2, SO_2, etc. are known though not potent like synthetic emicals. These are being converted by different cycles in nature such as N.C.S. cycles by different solid and air borne microorganisms and maintain ecological equilibrium in the ecosystem. Conversion of toxic to non-toxic chemicals during biodegradation is mostly known to be mediated by plasmids.

So genetic engineering can give the answer to the pollution problem by constructing the plasmid vehicles at random and by application of these vehicles in detoxification mechanisms in biological systems. Nowadays one can get detailed information of various plasmid genes of one's choice in gene bank which helps to construct a tailor-made organism of desired properties which can be utilised further for various detoxification systems.

NEWS FROM ABROAD

FOREIGN INVESTMENT IN AUSTRALIA

Foreign inventions are very encouraged to invest into the Australian tanning industry. A range of investment incentives are on offer according to the Australian High Commission in Hong Kong in a bid to boost Australia's 80 strong tanning community employing 2600 people. Turnover for the industry exceeds an annual A $20 million and exports top A $120 million.

— Leather in Asia, 4, (3), 1989.

INDIAN EXPORT EXCEEDS TARGETS

Indian export of finished leather and leather products have risen in both volume and price to the point where 1989 results could be double the official government target. Exports are already higher than the forecast Rs. 14,000 million at Rs. 16,080 million the target according to the Seventh Plan is Rs. 8,700 million.

— Leather in Asia, 4, (3), 1989.

LEATHER FAIR IN CUBA

The first international fair of the textile, garment, footwear and leather work industries, Vestimo '90 is to be held in Cuba at Pabexpo, Havana, between Feb. 6 and 10, 1990. For the leather industry the aspects of interest include raw materials, components, machinery, plant and technology for the footwear and leather product manufacturing industry. —

World Leather, 2, (4), 1989.

LEATHER GARMENTS IN SAUDI ARABIA

There appears to be growing demand for leather garments in Saudi Arabia. In a buyer-seller meet arranged by the Cou cil for Leather Exports at Riyadh in March 1989 ten India companies exhibited a variety of leather products. Busines to the extent of Rs. 2.5 million was transacted on the spo and that business valued totally at Rs. 10 million may resul eventually from this initiator. The prospects of exporting leather hand bags, wallets, brief cases, together with safety and industrial shoes is particularly bright.

— World Leather, 2, (4), 1989

FISH SKINS LEATHER

The Neptune Leather (Canada) Ltd. near the Southern tip of Nova Scotia is gearing up to make fish skin leather for sales around the world. The Can $775,000 project will turn the skins of cod, cat fish and lobcock into exotic leather for garments, belts, shoes, hand bags, briefcases and wallets. The plant will initially produce about 5000 skins and hopes to build up to as many as 750,000.

— World Leather, 2, (4), 1989.

AUSTRALIAN LIVESTOCK INDUSTRY

The Australian livestock industry is on the threshold of an exciting innovation — electronic identification of animals. This is a potentially important step towards identifying animals from birth on the farm to the packing house with major side benefits for hide improvement. There is no need for branding. The electronic ID system has two component parts — An electronic 'identity card' which may be attached to or implanted in an animal. This contains a number unique to that animal and identifies the property to which the device is supplied, A machine called 'reader' which activates the identity card, picks up the number and can display it, store it, print it or transmit to computer.

— World Leather, 2, (4), 1989.

LEATHER ABSTRACTS

EFFECT OF RETANNAGES WITH ALUMINIUM-GLUTARALDEHYDE AND ALUMINIUM SYNTANS ON CHARACTERISTICS OF REDUCED CHROME WET BLUE, K. Nakagawa, H. Ishikawa and M. Sugita, *Hikabu Kagaku*, **35**, (1) 23, 1989.

The effect of aluminium-glutaraldehyde and aluminium-syntans on leather properties are analysed using the contour lines and measurement value in comparison with those of chrome-retanned leather. The results and sensory tests indicated that Al/GA retanned leathers were slightly thinner and lower in fullness although the sensory ratings except fullness were nearly equivalent to those of chrome retanned leathers. The effect of GA retanning on softness and fullness was weakened by using Al at the same time. Although mechanical properties of Al/GA retanned leathers were slightly lower than those of chrome retanned leathers, the effect of a combination retannage of Al and GA were not so significant.

MARKETING LEATHER IN 1990's, Bill Walker, *World Leather*, **2**, (4), 34, 1989.

A fascinating review of many of the necessary ingredients — from quality control in production to understanding fashion demands — is presented. This paper identifies the chain of events needed for successful marketing. These include the ability to make what is needed, the techniques of promoting the manufacturer in the mind and awareness of the customer, the role of leather in a specific area and strategic planning for the future. The ability to market what is needed is governed by Total Quality Management.

ENVIRONMENTAL CONTROL — THE WAY FORWARD, F. Balkav, *World Leather*, **2**, (4), 96, 1989.

Environmental control in the leather industry has become a pressing need on natural programmes to protect soil and water resources take effect. Nevertheless, there is not always a consensus as to how to achieve such control nor about who should take the lead role. This paper describes the evolution of environmental issues, the way government authorities are responding and some of the actions that industry as a whole can take.

HIDES AND SKINS — A GENERAL REVIEW, By the Commonwealth Secretariat, London, *Leder & Haute Market*, **411**, (26), 70, 1989.

This survey based on the previous year's report of the Commonwealth Secretariat gives a visible review of the worldwide raw material supply as well as the international leather industry. According to the individual species, the particular trends regarding slaughtering in individual states is shown. The same applies for leather production. Besides that the price developments, particularly at the auctions, is highlighted.

NEW PRODUCTS

NEW DEGREASER

Gelon 4488, a high quality non-ionic degreaser and surfactant for the leather industry has been developed by Boechme Filatex Inc. It is the result of intensive research to provide an effective emulsifier of natural greases found in today's hides & skins, while maintaining low costs for the tanner. It exhibits low foaming properties and is universally used in the beam lenses through colouring. Its effectiveness, when used in the processing of sheepskins, cattle hides and pig skins is said to be superior to many higher-priced products.

NEW FINISHING OIL

Atlas Refinery Inc. has introduced Atlasol FOC finishing-oil, a unique synthetic fat liquor that performs as a fine topping oil especially for boots, shoe uppers and other crust leathers providing excellent pull-up and oil look effects. It is the only topping oil that can be applied by a simple spray or swab-on, at later stages of leather goods processing. Application after dumping also provides leather goods manufacturers with a closer control of chemical additives to the finished product. *The Leather Manufacturer, 107, (5), 1989.*

INDIAN LEATHER SCENE

TANNERS SEEK CHANGE IN QUOTA SYSTEM

Leather tanners in the country have appealed to the Government to continue to allow export of a minimum quantity of semi-processed leather under the quota system. They have also sought a change in the present quota system under which the highest bidders bagged the quotas, much to the disadvantage of genuine small-scale tanners and exporters who quote only realistic prices.

Addressing the annual general meeting of the All-India Skin and Hide Tanners and Merchants Association at Madras on October 5, Mr. C.K. Duraivelan, President of the Association, said while allowing continued export of the semi-processed leather, the Government should see to it that the quotas are issued to erstwhile exporters. This is important for the very survival of small and tiny tanner-exporters, he added.

He also held that the demand by a section of the product manufacturers to regulate export of finished leathers is fraught with adverse consequences. Such a measure will seriously affect the country's export earnings. For one, the domestic products industry can absorb only a part of the entire production of goat skins, leaving a huge surplus which can be exported. Besides, the bovine tanners are now able to dispose of lower grades by exporting them, realising better values.

These apart, any regulatory move may result in the major products importing countries resorting to retaliatory measures for being denied access to the country's finished leathers, Mr. Duraivelan warned. Referring to other aspects of the industry, he said the Government should extend support for modernising and upgrading tanning and finishing techniques. The industry should be given the facility of concessional finance for import of machinery and technology, to begin with. Experts from other countries, especially from Italy, may also be invited to help in the modernisation process.

To meet the shortage of trained personnel, the Government should start training institutes for which the industry itself may extend cooperation by way of sponsorship or by actually running the institutes. In regard to effluent treatment projects, Mr. Duraivelan said the tanneries have already formed joint stock companies for collective disposal of the effluents. He, however, wanted the Centre and the State Governments to give subsidies, now available to common projects, to individual units which also are located away from the cluster of tanneries.

Mr. M.M. Hashim was elected the new President of the association for a two-year term beginning 1989.

MODERNISATION FUND FOR TANNERIES URGED

A modernisation fund for the leather tanning industry on the lines of a similar fund, for the engineering sector should be immediately set up for encouraging speedy modernisation of the leather tanning industry, chairman of the Council for Leather Exports, Mr. M.M. Hashim has suggested. The fund should be operated by an agency like the IDBI and advances should be made on liberal scale at a concessional rate of interest.

The CLE chairman is of the view that the modernisation of the tanning sector quickly will enable Indian tanners to produce a wide variety of leathers, of consistent quality and in a range of colours. The Indian tanning industry has basically emerged as shoe upper leather manufacturers in the '70s and '80s and this structure has not changed significantly. In the last seven to eight years the leather garment industry has grown significantly and so is the leather goods sector.

But except for some tanners in Calcutta who are making fairly good quality cow hides suited for ladies handbags and the southern tanning units making varieties of leather for leather goods, the tanners as a whole are yet to strengthen their ability to make a variety of leathers suited for different end-users.

Modernisation, therefore, should aim at not only inducting new machines in certain operations but also be the vehicle for obtaining the latest processes and chemicals for producing the right type of leather for particular end-users most economically.

Mr. Hashim has said that it is high time the Indian industry inducted machines and processes to achieve optimum output from the raw materials which are becoming costlier and scarcer. If raw materials are allowed to become costly and scarce it will stand in the way of India achieving better unit value realisation for its exports which is dependent upon its ability to move up market and provide world market with consistently better quality products at more competitive prices.

NDIA'S GOOD SHOW AT PARIS LEATHER FAIR

Indian leather and leather goods attracted business worth ver Rs. 62 crores at the recently concluded Semaine du Cuir, 989, Paris. More importantly, the fair threw up enough indi- ations of what is in store for the country in the international narket, especially in the context of the ambitious export tar- gets sought to be achieved over the next decade.

Of all items, leather garments came in for maximum atten- ion at the fair, proving once again the country's great poten- ial in this segment in the world market. Going by the trend, he Council for Leather Export (CLE) reckons that its export in the current year may well surpass the Rs. 250-crore mark.

In the footwear segment too, the country exhibits gener- ated good demand, dispelling the gloom triggered by the extremely sluggish growth in the export of this item in recent months. Buyers from FRG, France, the UK, the US, Canada and Japan showed keen interest in the Indian products. This has instilled confidence in CLE that export of footwear this year will top Rs. 200 crores.

Another segment that holds out promise for the country is leather goods. There were a lot of enquiries for the goods, particularly briefcases both for gents and unisex, and a good number of orders were also placed. It is projected that the export of these products in the current year will touch Rs. 250 crores, if the enthusiasm shown by the buyers at the fair is anything to go by.

According to CLE, the trend at the fair has been a pointer to the growing acceptance of India in the global market as a source of quality leather and leather goods. At the same time, it provided an opportunity for the Indian industry to look inward and identify specific shortcomings which will have to be tackled in a time-bound manner in order to sustain the tempo of progress.

For instance, the leather garments have become one of the country's strongest points in the export arena promising impressive growth rates in the years ahead. But the present capacity and its pattern have much to be desired. It is felt that it is time for the establishment of some big manufacturing facilities capable of taking up large orders, which will also ensure supply of right products at the right time.

It also emerged from the Paris fair that the Indian raw material prices have been shooting up beyond international levels. This is attributed to the fact that while on the one side the domestic demand for hides and skins has gone up manifold, their supply has failed to keep pace with it. Also, imports of hides and skins have not been up to the required level.

LEATHER GOODS MACHINERY FAIRS: ITALY, GERMANY FOR COMMON APPROACH

Italian and German manufacturers of leather goods machinery are working out a common response to future fairs and exhibitions in India. Sources at Assomac told The Economic Times at Milan that in future, specific fairs which the Italians do not attend will also not see German participation.

This move is significant as the two countries are major competitors in the Indian market for leather goods machinery. And this competition has in the past been quite severe. Indeed, one Italian manufacturer even claims that the Germans have sometimes bought Italian machinery at lower prices and resold it under German names.

What appears to have brought the two competitors together are common complaints about the organisation of the fairs in India. Italian leathergoods machinery manufacturers are clearly not satisfied with the facilities available. And a major drawback in their view is that the fair being held in Madras does not allow them to tap the potentially large north Indian market.

Attempts to tap the Indian market through joint ventures with Indian companies have also not found favour with Italian manufacturers. The major constraint here appears to be the buy-back condition. Assomac sources point out that most Italian manufacturers of leather goods machinery being small or medium-size companies they cannot afford such guarantees.

BRITISH FIRM TO PROMOTE HOT MELT ADHESIVES IN INDIA

A hot-melt polyamide resin adhesive that is fast, non-toxic, non-hazardous and non-flammable will be promoted during the trade mission to India organised by the Birmingham Chamber of Commerce from 3 to 10 October. Mr. Rodger Spooncer, Sales Manager of Evacor Resins, will be talking mainly to shoe manufacturers, though his company's resins are used also in thermographic printing, the production of cans, batteries and oil filters, and many other areas of manufacturing.

Polyamides offer many health and safety benefits in manufacturing. They also bond in seconds, compared with the 15-20 minutes taken by some adhesives; output is increased and quality improved. Evacor currently supplies resins to the Bata group, which has shoe factories in Lahore and Calcutta. As well as visiting that organisation, Mr. Spooncer will investigate the possibility of establishing distribution to reach new customers.

The company which is part of the Evode group exports 70 per cent of its output. For more details contact: Evacor Resins Pvt. Ltd., Common Road, Stafford, England ST16 3EH. Telex: 36161, Fax: +44 785 55093.

TANNERY EFFLUENTS USEFUL FOR FODDER CROPS

A recent study conducted in Madurai district of Tamil Nadu indicates that treated industrial effluents from tannery units can be used to raise good fodder crops. The study, conducted by the Agriculture College and Research Institute of the Tamil Nadu Agriculture University, found that while the quality of well water near the pollution source deteriorated, the effects of treated effluents were positive on the soil quality.

A pot culture experiment was conducted with a test crop of ragi in two soil series — Irugur and Palathurai — which occupy major areas in Dindigul Taluk of Madurai district. The crop was treated at four irrigational levels with tap water, 25% tannery effluent, 50% tannery effluent and 100% retannery effluent. The crop was also treated with varying percentages of gypsum added to the effluents.

The study revealed that irrigation with increased concentration of effluent significantly increased soil pH, electrical conductivity, organic carbon and other minerals. Irrigation with 25% effluent along with addition of gypsum was found to be the best in recording the highest straw yield. Irrigation with increasing concentration of effluent increased nitrogen, phosphorous and sodium contents. Irrigation with 25 and 50% effluent influenced the nutrient uptake by ragi straw. Based on findings of the study, researchers suggest that irrigation with water having 25% of tannery effluent could be used for raising a good ragi crop.

Similarly, irrigation with 50% effluent content and with treated effluent only could also give luxuriant foliage growth in ragi crop. Tannery effluent can also be used as a profitable irrigation medium for growing grasses like Giant Napier, which have proved a success under sewage irrigation. The application of gypsum followed by pressmud also proved effective in increasing available nutrient status of the soil and plants.

SMALL LEATHER UNITS RESENT DUTY HIKE ON METALLIC ITEMS

The Small Scale Leather Industries Federation has resented the recent hikes in basic duty on metallic embellishments such as hooks, magnetic locks, clips, etc. which have been increased from 40% to 187%. Mr. Prakash H. Mathani, president of Small Scale Leather Industries Federation, in a pres note, said the hikes would adversely affect the productio and ultimately exports of leather products.

He also added if hikes were not withdrawn many smal leather units would close down rendering hundreds unem ployed. While he hailed the Government policy of liberal isation and steps taken to boost exports, he felt, the hikes i duty was a retrograde step and was curbing exports of value added products from India.

POLYURETHANE SHOE

The 'Adidas' shoe manufacturer Adi Dassler Co., KG based in West Germany has launched its 'torsion shoe' into market. This shoe provides more freedom of movement and greater safety. A torsion groove and rod have been moulded into the sole and, together with the midsoles and outsoles, ensure that the foot, and thereby the whole body, can move naturally. The midsole is made from a new polyurethane specially developed for this application. It is based on Bayflex, a raw material system for flexible integral skin foams manufactured by Bayer AG.

The torsion shoe was developed with the aim of exactly duplicating the natural movement of the foot and allows the foot to adapt to various surfaces, keeping the leg in the correct position. This cannot be fully achieved with conventional shoes as too much of the movement of the forefoot is transmitted to the heel.

The torsion groove in the newly developed sole ensures that the forefoot and heel have a certain degree of independent movement and that the foot twists at exactly the right place, at the ankle. The torsion rod gives the foot the necessary sideways stability, rolls with the foot around its longitudinal axis and prevents it from rolling too much. The rod also prevents the sole from bending at the wrong place.

Flexion occurs at the metatarsophalangeal joints (where the toes join the foot). It allows uninhibited development of the foot's natural lever action and makes the bounce back off the ground springier.

The density of the polyurethane foam used for the midsole is some 25 per cent lower than that of other PU systems. The sole is, therefore, light yet highly elastic with good dimensional stability and very good longterm performance properties.

For further information write to Jagat Chemicals Pvt. Ltd., 17th Floor, Express Towers, Nariman Point, Bombay-21.

MARKET INFORMATION

Intermediate prices fall

PVA (173) went upto Rs. 130. ooked materials yet to arrive have aused a tightening in the supplies. solvents, acetone went up by s. 3.50 to Rs. 24 per kg. DEG ame down by Rs. 3 to Rs. 40 per kg with strong supplies. On account of a glut in dye intermediates due to advance materials being available, prices of dye intermediates came down. Demand is good with good export prospects.

We cannot guarantee the accuracy of the prices published in CHEMICAL WEEKLY as they are based only on the enquiries made by our correspondent – and, as such they are not FIRM PRICES as between a buyer and seller. The prices are published only with a view to giving some ideas of the market conditions.

The prices are inclusive of Excise and Maharashtra Sales Tax.

(Prices as on October 16, 1989)

NDUSTRIAL CHEMICALS	Per Kg.
Ammonium sulphate	2.50
Ammonium phosphate (Mono)	14.50
Ammonium phosphate (Di)	14.00
Ammonium carbonate (Di)	17.00
Ammonium bicarbonate	5.60
Ammonium chloride	3.00
Ammonium nitrate	6.00
Arsenic white powder	22.00
Acrylamide (Resale)	74.00
Barium carbonate	6.00
Bleaching powder (33% Cl)	4.20
Borax (Granular)	15.00
Borax (Powder)	15.25
Boric acid (Tech)	28.00
Bisphenol-A	82.00
Butyl carbitol	110.00
Caustic soda (Flakes)	12.50
Caustic soda (Solid)	12.00
Caustic soda (Lye)	10.00
Calcium chloride 70% (Solid)	3.25
Calcium chloride 75-80%(fused)	3.50
Calcium chloride 36% (Anhydrous)	5.00
Calcium carbonate (precipitated)	4.25
Calcium carbonate (Activated)	4.75
Cobalt oxide	280.00
Cresylic acid	52.00
Camphor (Indian)	105.00
Cream of Tartar (Tech.) China	70.00
Citric acid (Belgium) (Resale)	47.00
Citric acid (Indian) (Resale)	47.00
Copper sulphate	24.00
Chromic acid	63.00
Ethylene urea	58.00
Ferric chloride (Lumps)	5.50
Ferric chloride (Anhydrous)	16.00
Glue flakes	15.00
Glue sheets	6.75
Gohsenol GH-17	112.00
Hydro	44+ST

Hyflosupercell	21.00
Hexamine (Resale)	35.00
Industrial Wax	25.00
Litharge	40 00
Lead Acetate (Tech)	31 25
Lithopone	25.00
Magnesium chloride (Crystal)	3.00
Menthol crystal (Flakes)	900+Ex+ST
Menthol bold	665+Ex+ST
Menthol crystal cold	700+Ex+ST
Magnesium carbonate (Japan)	16.00
Magnesium carbonate (Indian)	18.00
Maleic Anhydride (Resale)	40.00
Mercury (34.5 Kgs)	12,000.00
Nickel chloride	110.00
Oxalic acid (Resale)	22.00
Peppermint oil (Rectified)	195+Ex+ST
Potassium carbonate (Indian)	34.00
Potassium carbonate (Imported)	33.00
Potassium bichromate	32.50+ST
Potassium phosphate (Mono)	14.00
Potassium phosphate (Di)	14.00
Polyvinyl alcohol (No. 117)	115.00
Polyvinyl alcohol (No. 173)	130+ST
Polyvinyl alcohol (No. 208)	150.00
Paraformaldehyde (Resale)	26+ST
Phthalic anhydride 36% (Resale)	25.50
Pentaerythritol (Resale)	45.00
Paraffin wax	20+ST
Rangolite (German)	90+ST
Rangolite (Czech.)	80+ST
Sodium sulphate (Fine)	6.00
Sodium sulphate (Coarse)	5.00
Sodium sulphide 50-52% (Flakes)	11+ST
Sodium sulphide 58-60% (Flakes) (TCL)	20.00
Sodium sulphide pure (Flakes)	12.25
Sodium nitrite (Resale) per 50 kg	680 00
Sodium chlorite 80% (Spain)	88 00
Soda Ash (Tata)	5.00
Soda Ash (Birla)	4.50
Soda Ash (Imp.)	4.50
Sodium bicarbonate	7.50
Sodium bisulphite	4.50
Sodium silicate	3.00
Sodium acetate	5.00
Sodium alginate	250+ST
Titanium Dioxide (Anatase)	110+ST
Titanium Dioxide (Rutile – RCR_2)	150.00
Tartaric acid	100.00
Trisodium phosphate	5.50
Thiourea	80+ST
Urea (Tech.)	2.90
Vacuum salt	1.00
Zinc Dust	32.00
Zinc Oxide	58.00
Zinc chloride powder (Tech.)	12.50
Zinc sulphate	7.00

SOLVENTS	Per Kg.
Acetic Acid Glacial (Resale)	14.00
Acetic Anhydride (Resale)	31.50
Acetone (Resale)	24.00
Adipic Acid	70.00
Aceto Acetanilide	55.00
Aniline Oil	60.00
Benzoate Plasticiser	62.00
Butyl acrylate	78+ST
Butyl stearate	50.00
Butanol	35+S
Benzyl Alcohol	60 0
Benzyl Chloride	34 0
Benzo trichloride	16 0
Benzoyl chloride	22 0
Bromine Liquid	75 0
Chloroform	31 0
Carbon Tetrachloride	20 0
Cellosolve	57 0
Cyclohexanone	56+S
Cyclohexanol	58+S
Diacetone (Resale)	34 00
Diethyl Oxalate	34 00
Diethyl glycol (DEG)	40 00
Dioctyl Phthalate	45 00
Diallyl Phthalate	56 00
Dimethyl Phthalate	28 00
Dioctyl Adipate	52 00
Dibutyl Adipate	42 00
Dipentene	15 00
Dimethylamine 40%	26 00
Dimethylamine 50%	30 00
Ethyl Acetate	22 00
Ethyl Acrylate	65 00
Ethylene Dichloride	14 50
Ethylene Glycol	45+ST
Formic Acid (Imp.)	24 00
Formaldehyde (Resale)	7.50
Glycerine (CP)	55.00
Glycerine (IW)	53 00
Hydrogen Peroxide 50% (Resale)	26 50
Isopropyl Alcohol	39 00
Isobutyl Alcohol (Resale)	30 00
Monoethanolamine (Resale)	65 00
Melamine	58+ST
Methyl Ethyl Ketone	35+ST
Methyl Isobutyl Ketone	58 00
Methyl Acrylate	60 00
Methyl Dichloride (Resale)	26 00

Carbitol	68+ST
Meta Cresol	45.00
Nitrobenzene	30.50
Nitric Acid (Conc.) (RCF)	2.50
Ortho Cresol	30+ST
Phenol (Resale)	38.00
Propylene Glycol	55.00
Polyethylene Glycol (No.200)	58.00
Polyethylene Glycol (No.400)	75.00
Polyethylene Glycol (No.500)	52.00
Polyethylene Glycol (No.1600)	54.00
Polyethylene Glycol (No.4000)	70.00
Polyethylene Glycol (No.6000)	85.00
Para Cresol	110.00
Styrene Monomer	35+ST
Sorbitol	14.00
Sulphuric Acid	2.80
Trichloroethylene	29.00
Triethanolamine (Resale)	65.00
Turpentine Oil (Germany)	8.00
Turkey Red Oil (50%)	20.00
Vinyl Acetate Monomer	47.50

SOLVENTS	Per Litre
Benzene	10.80
N-Heptane	10.50
N-Hexane	12.00
Methanol	10.00
Solvent Naphtha Heavy	10.50
Solvent Naphtha Light	8.50
Toluene	18.00
Xylene	20.00

DYES INTERMEDIATES (PRICES ARE WITHOUT TAX AND EXCISE)

Alphanaphthylamine	63.00
Alpha Naphthol (Imp.)	185.00
Aceto Acetic Ester (Methyl)	66.00
Ammonium Molybdate	210.00
Anthraquinone	125.00
Anthranilic Acid	80.00
2-Amino 4-Nitrophenol	140.00
Blue B. Base (Local)	260.00
Beta Naphthol (Atul)	78.00
Benzidine Dihydrochloride (BDH)	98.00
Bromamine Acid	600.00
BON Acid	130+Ex+Ta
Chicago Acid (Atul)	340.00
Coach Acid	58.00
C. Acid (Imp.)	220.00
Cyanuric Chloride	133.00
2,4- DNCB	30.00
Dihydrothio PTOS (Imp.)	1,000.00
Dimethyl Aniline	71.00
Diethyl Aniline	180.00
Diamino stilbene disulphonic acid	165.00
3,3-DCB (Imp.)	180.00
Gamma Acid (Atul)	200.00
H. Acid (Atul)	125.00
G. Salt	77.00
Isophthalic Acid	45.00
J. Acid	365.00
J. Acid Urea	410.00
K. Acid	125.00
MPDS (German)	190.00

MNA	155
Meta Ureido Aniline	235
MPD (Local)	215
MPD (Japan)	240
Naphthenic Acid	40
N-Methyl J. Acid	620
N-Methyl Aniline	125
Naphthalene (Refined)	20
Ortho Anisidine (OA) (Imp.)	110
Ortho Dichloro Benzene (ODCB)	17
OT Base	140
Para Dichloro Benzene (PDCB)	29
Para Anisidine (PA local)	155
PNA	118
Para Cresidine (Imp.)	400
Para Amino Azo Benzene (India)	180
PNCB	60
Para Amino Acetanilide	190.00
1-Phenyl 3-Methyl 5-Pyrazolone	170.00
Phenyl J. Acid	360.00
Para Amino Benzoic Acid	135.00
PT Base	155.00
Rhoduline Acid	550.00
Resist Salt 80%	27.00
Resorcinol	210.00
Sodium Naphthionate	65.00
5-Sulpho-Anthranilic Acid	82.00
Sulphanilic Acid	50.00
Sulpho Tobias Acid	170.00
Trichloro Benzene (TCB)	22.00
Tobias Acid	175.00
Metanilic Acid	43.00
MTD	120.00

Bombay Dyes Market

(Prices as on October 16, 1989)

ACID COLOURS	Per Kg.
Acid Violet 4BS	*190.00
Acid Maroon V	110.00
Acid Orange II	112.55
Acid Orange IIY	93.85
Acid Red A	137.00
Acid Scarlet 3R	128.35
Acid Red 3BN	*195.00
Acid Red R2R	132.00
Acid Red RS	88.00
Acid Patent Blue AS	*280.00
Acid Green V	*375.00
Acid Coomasi Blue	200.00
Acid Yellow 5GN	65.00
Acid Red PG	85.00
Acid Red GRS	78.00
Acid Black 10 BX	157.15
Acid Black BX	126.95
Acid Black Wax	135.50
Crosein Scarlet MOO	200.30
Procinil Yellow GS (ICI, UK)	265.00
Procinil Red GS (ICI, UK)	530.00
Procinil Blue RS (ICI, UK)	315.00
Procinil Scarlet G (ICI, UK)	600.00
Procinil Orange G (ICI, UK)	250.00
Procinil Rubine (ICI, UK)	550.00

* To get resale price add 6% tax.

DIRECT COLOURS	Per Kg.
Yellow 3GX	114.00
Gun Yellow RCH	175.85
Fast Yellow GCH	171.50
Yellow CFG Hly. Conc.	721.00
Fast Yellow GS	126.96
Fast Yellow CHRS	116.85
Viscose Orange A	210.35
Fast Orange GR	171.50
Red	122.65
Dark Tan	98.15
Red IIR	98.15
Red 4B	217.55
Bordeaux BW	170.10
Fast Scarlet 4BS	223.50
Red 12B	220.45
Bordeaux Hly. Conc.	249.20
Cotton Red N	117.05
Brill. Fast Helio B	362.85
Brill. Fast Helio 2R	385.85
Brill. Fast Helio 2RS	177.30
Brill. Fast Helio BS	116.10
Brill. Violet Extra	181.45
Blue 2B	102.50
Blue G	220.45
Sky Blue FB	242.00
Copper Blue GR	190.25
Fast Greenish Blue GL	114.60
Developed Black BT	149.95
Blue NB-2B	348.45
Blue NB-2BG	214.70
Developed Black NB-GHB	214.70
Green B	142.75
Green NB-B	218.90
Green 2B-N	218.90
Brown MR	197.40
Brown CN	137.00
Golden Brown G	175.85
Catechin G	155.70
Omega Tan	161.45
Catechin GS	102.80
Black E Hly. Conc.	180.15
Black E Extra Hly. Conc.	180.15
Black NB-ER Hly. Conc.	290.50

DISPERSOL COLOURS	Per Kg.
Red B 3B Conc	611.50
Red B 2B Conc	797.90
Red CB Powder	1048.25
Red D2B Powder	589.85
Violet C 4R Conc.	1202.70
Blue BG Conc	580.65
Blue BN Powder	128.20
Blue D 2R Powder	588.25
Navy BT Conc	531.95
Blue B 2G Conc	577.95
Black BT Conc	319.50
Blue BR	482.40
Yellow 7GL	813.20
Yellow 5RX	269.90
Yellow 3G	473.20
Yellow	140.00
Yellow AL	167.20
Yellow Brown REL	311.70
Yellow FFL	571.40
Gold Yellow GG	320.80
Pink REL	593.00
Red BEL	615.60
Red 2B	422.40
Red FB	425.80
Red Violet FBL	622.00
Orange 3R	254.20
Violet 3R	370.50
Violet RL	355.70
Violet 6R	638.20
Scarlet RR	283.50
Rubine 3B	289.10
Rubine CB	449.50
Blue GL	419.00
Blue BGF	805.80
Navy Blue RE	359.90
Brown 3REL	272.80
Black GEL	420.10
Dark Brown 3B	411.10

BASE COLOURS	Per Kg.
Fast Yellow GC	77.75
Fast Orange GC	128.40
Fast Scarlet R	198.05
Fast Scarlet RC	128.40
Fast Scarlet RCR	105.60
Fast Scarlet G	115.75
Fast Scarlet GN	92.95
Fast Scarlet GG	77.75
Fast Scarlet GGS	73.95
Fast Red B	233.50
Fast Red RC	115.75
Fast Red R Flakes	158.80
Fast Red TR	181.60
Fast Red TR Oil	223.35
Fast Red RL	251.20
Fast Red KB Oil	251.20
Fast Bordeaux GP	236.00
Fast Garnet GBC	103.05
Fast Violet B	548.80
Fast Blue BB	566.50

NAPHTHOL COLOURS	Per Kg.
ASG	301.85
AS	205.65
ASSW	379.10
ASBS	253.75
ASBO	296.40
ASD	209.45
ASOL	243.60

ASTR	369.00
ASPH	336.05
ASE	236.00
ASEL	249.95
ASLB	2002.35
ASBT	2459.45
ASWG	143.00
ASSG	538.65
ASSR	652.60

PROCION COLOURS	Per Kg.
Golden Yellow HR	207.95
Brill. Yellow H4G	145.65
Supra Yellow H-8GP	168.55
Brill. Yellow HE6G	214.75
Yellow G-E4R	276.05
Brill. Yellow H7G	332.30
Yellow M4R	275.45
Yellow MGR	387.65
Brill. Yellow M4G	201.15
Brill. Yellow M8G	366.10
Yellow M3R	244.70
Brill. Orange H2R	303.80
Brill. Red H7B	157.95
Brill. Orange M2R	313.15
Brill. Red H8B	213.55
Brill. Scarlet H RN	245.05
Supra Red H-3BP	179.80
Brill. Red H-F3B	243.45
Brill. Magenta HB	182.00
Brill. Red M 5B	160.05
Brill. Red M 8B	218.35
Brill. Pink MB	137.10
Brill. Magenta MB	163.65
Brill. Purple H-3R	219.55
Brill. Purple H-7R	175.40
Navy Blue H 3R	333.75
Brill. Blue H-GR	406.40
Brill. Blue H5G	207.95
Blue H 5RX	286.20
Brill. Blue H 7G	213.95
Brill. Blue H 7RX	358.15
Turquoise HA	265.05
Supra Blue H-3RP	595.30
Supra Turquoise H 2G P	181.50
Blue H-FRD	305.80
Navy Blue H3R	333.75
Blue H 5RX	286.20
Navy Blue M3R	355.70
Brill. Blue MR	405.60
Brill. Blue M RX	214.20
Brill. Blue M-G	226.45
Blue M 4GD	369.40
Navy Blue M RB	341.85
Turquoise M-G	240.30
Brill. Blue M GX	516.25
Blue 3R Acra Powder	718.20
Dark Brown H 6R	248.45
Cobalt Oxide	285.00
Green H4BD	287.00
Green H-E4BI	169.80
Red Brown H IF	143.25
Orange Brown H 28	209.05
Brown M GRN	188.80
Black H-N	314.20

SULPHUR COLOURS	Per Kg.
Navy Blue	210.35
Green G	194.55
Black Grains Extra	72.25
Black Grains OG	73.70
Black GXE Conc.	70.85
Black GXE	57.90
Black GXR	69.40
Black Grains 800	62.80
Black EXR Grains	73.70
Black EXR Grains 800	59.35

VAT COLOURS (ICI)	Per Kg.
Yellow 5G Supra Disperse	561.85
Yellow 5G Acra Conc	818.60
Gold Orange 3G Pdr. Fine	1158.45
Brill. Orange 6R Pdr. Fine	624.35
Gold Orange 3G Supra Disp	693.85
Brill. Orange 6RX Powder	394.30
Brill. Red 3B Pdr. Fine	1214.15
Brill. Red 3B Supra Disp	867.45
Brill. Purple 3R Acra Powder	827.05
Brill. Purple 2R Hly Conc.	744.25
Brill. Purple 4R Supra Disp.	604.25
Brill. Purple 2R Acra Conc.	779.85
Blue 2R Powder Fine	675.30
Blue BC Acra Con Pdr. Fine	1013.15
Blue BC Conc. Pdr. Fine	713.65
Blue R Conc. Pdr. Fine	719.70
Blue Conc. Powder	645.80
Brill. Blue 2R Hly. Conc.	378.55
Blue RR Supra Powder	629.35
Brill. Blue 2R Supra Disp.	115.65
Dark Blue 2R Powder Fine	512.65
Blue BC Supra Disp.	419.65
Jade Green XBN Powder Fine	555.80
Jade Green XBN Acra Conc. Pdr	1026.05
Jade Green 2G Pdr. Fine	533.25
Jade Green 2G Ptg. Paste	125.40
Jade Green XBN Ptg. Paste	126.00
Jade Green 2G Supra Disp.	618.00
Olive D Pdr. Fine	563.90
Olive Green B Supra Disp.	421.70
Jade Green XBN Supra Disp. (N)	327.30
Olive OMW Powder Fine	698.55
Olive OMW Supra Disp.	538.05
Olive D Supra Disp.	361.70
Olive R Supra Disp.	470.25
Olive D. Ptg. Paste	193.00
Olive Green B Ptg. Paste	199.10
Olive Green B Acra Conc.	741.10
Olive R Acra Conc.	779.85
Brown R Pdr. Fine	869.45
Dark Brown 3R Fine	826.25
Brown G Supra Disp.	582.05
Brown 2G Supra Disp.	716.10
Brown R Supra Disp.	547.35
Brown BR Powder	867.75
Dark Brown 3R Ptg. Paste	217.15
Dark Brown 3R Supra Disp.	529.60
Brown G Acra Conc.	967.95
Brown M. Powder Fine	768.80
Grey M. Supra Disp.	585.45
Blue BC Acra Conc. Pdr. Fine	762.70
Direct Black AC Supra Disp.	415.75
Direct Black AC Pdr. Fine	574.70
Direct Black CH Supra Disp.	490.45
Direct ACD Ptg. Paste	217.15

Delhi Market

DELHI: OCT. 16, (NNS) Mercury suffered a steep fall of Rs. 200 at Rs. 10,900 per flask in the local chemicals market during last week, on account of persistent offerings as well as, lower advices from Bombay. In Bombay, mercury, slumped from Rs. 10,800 to Rs. 10,600 per flask. Sufolite, on the other hand, hardened further by Rs. 6 at Rs. 87 and chatkolite jumped by Rs. 10 at Rs. 90 per kg on account of negligible stock in the market, as well as fall in fresh supply. In the absence of fresh import from Germany and acute shortage of stock, rangolite Germany flared up from Rs. 105 to Rs. 115 in the wake of sustained demand by gur makers.

Titanium dioxide RC-822 and RCR-2 slumped sharply by Rs. 15 at Rs. 135 each per kg in the absence of any demand and discouraging advices from Bombay. Titanium dioxide anatase, on the other hand, moved up by Rs. 3 at Rs. 125 in the beginning of the week due to persistent offerings speculation, but at the weekend, in the wake of persistent offerings from China and heavy selling pressure by stockists, prices of this commodity reacted sharply by Rs. 5 and closed at Rs. 120.

Sodium hydrosulphite Demosha and Kalali softened by 50 paise at Rs. 35.50 and Rs. 36.50/kg on withdrawal of demand. In the wake of comfortable stock position, Tamil Nadu Hydro eased by 50 paise at Rs. 35.50.

Tartaric acid Indian Trishul hardened sharply by Rs. 150 at Rs. 3,400 per 15 kg due to acute shortage of stock, as well as fall in demand from France. As a result of tight supply along with sustained demand from Delhi and Calcutta, ammonia bicarb hardened by Rs. 5 at Rs. 155 per 25 kg. In the wake of poor supply and heavy demand by candle manufacturers, paraffin wax jumped up sharply by Rs. 40 at Rs. 900 per 50 kg. Citric acid Bombay Dyeing quoted cheaper by Rs. 25 at Rs. 2,450 and camphor powder eased by Re. 1 at Rs. 100 per kg. Menthol flake and bold moved up by Rs. 5 at Rs. 300 and Rs. 355 per kg on poor arrivals and increased demand. Menthol flake Diwali and December delivery were transacted at Rs. 315 and Rs. 325 against Rs. 310 and Rs. 315 per kg. Mentha oil ruled quiet at Rs. 210/230 per kg. No noticeable variation was recorded in dyes and colours during the week.

(DELHI MARKET RATES AS ON OCTOBER 13, 1989)

Ammonia Bicarb (Per 25 Kg.)	155.00
Mercury (Per flask)	10,900.00
Soda ash (Per bag)	335/355.00
Ammonium Chloride (50 Kg.)	110/180.00
Caustic soda flakes (50 Kg.)	565.00
Citric acid (Per 50 Kg.)	2,150/2,450.00
Stable Bleaching Powder Shriram (Per 25 Kg.)	100.00
Stable Bleaching Powder KCI (Per 25 Kg.)	95.00
Stable Bleaching Powder Maruti (Per 25 Kg)	90.00
Stable Bleaching Powder Modi (Per 25 Kg)	98 00
Sodium Bicarbonate (50 Kg.)	290/300.00
Sodium Hydrosulphite (Per Kg.)	34.00/36.50
Rangolite (Per Kg.)	87.00/115.00
Boric acid Technical (Per 50 Kg.)	1,500.00
Paraffin Wax (Per 50 Kg.)	900.00
Tartaric Acid (Trishul Per 15 Kg.)	3,400.00
Borax Granular (Per 50 Kg.)	750.00
Borax Crystal (Per 50 Kg.)	750.00
Sodium Nitrite (Per 50 Kg.)	700/760.00
Sodium Nitrate (Per 50 Kg.)	425.00
Camphor Thal (Per Kg.)	109.00
Camphor Powder (Per Kg.)	100.00
Menthol Bold (Per Kg.)	355.00
Menthol Medium (Per Kg.)	330 00
Menthol Flake (Per Kg.)	300 00
Glycerine (Per Kg.)	55/58 00
Sodium Silicate (Per quintal)	275/350 00
Hexamine (Per Kg.)	33 50
Acetic Acid Glacial (Per Kg.)	15 00
Copper Sulphate (Per quintal)	2,400/2,750
Formic Acid (Per Kg.)	25.00
Formaldehyde (Per Kg.)	8.50
Hydrogen Peroxide (Per Kg.)	27/28.00
Calcium Carbonate (Per Tonne)	2,500/4,000
Acid Slurry Soft (Per Kg.)	28 00
Acid Slurry Hard (Per Kg.)	38.00
Phosphoric Acid (Per 50 Kg.)	1,050 00
Potassium Nitrate (Per quintal)	900/1,200.00
Potassium Permanganate (Per 50 Kg.)	2,800/3,200.00
Sodium Bichromate (Per 50 Kg.)	1,575/1,600.00
Trisodium Phosphate (50 Kg.)	550 00
Titanium Dioxide Anatase (Per Kg.)	120 00
Titanium Dioxide RC-822 (Per Kg.)	135.00
Titanium Dioxide K-Brand (Per Kg.)	102.00
Titanium Dioxide RCR-2 (Per Kg.)	135 00
Zinc Oxide (Per metric tonne)	42,000/52,000.00
Phenol Carbolic Acid (Per Kg.)	37.00
Carbon Tetrachloride (Per Kg.)	24 25
Chloroform (Per Kg.)	28 00
Sodium Sulphate (Per metric tonne)	3,300/3,900.00
Naphthalene Balls (Per 50 Kg.)	1,325.00

DYES & COLOURS	(Per Kg.)
Naphthol AS	175/201 65
Naphthol ASG	180/295.20
Naphthol ASBS	210/248.45
Naphthol ASTR	265/360.45
Naphthol ASOL	210/238.60
Naphthol ASBO	195/260.75

DIRECT DYES	(Per Kg.)
Black E. Conc.	110/176 90
Diazo Black B.T.	105/147.55
Green B	90/140.55
Blue 2-B	60/101 40
Blue 2-B 225% (JNR)	125.00
Sky Blue FB	160/235.05
Basic Auramine	55/110 00
Basic Rhodamine	300/425 00
Basic Methylene Blue	100/180 00
Basic Violet	150/180 00
Basic Malachite Green	150/165 00
Acid Orange	75/111 20
Congo Red H/C	75/120 95

Madras Market

Markets were dull on account of continuous holidays. Caustic prices continue to dip. While both Mettur Chemicals and Andhra Sugars have maintained their rates at Rs. 590 per bag of 50 kgs, other manufacturers have dropped their prices to Rs. 575 per bag. There was brisk business in methanol as it was the cheapest solvent available. In solvent buying buyers were cautious since there is a downward trend in most of the solvent prices. Acetone price kept up its upward trend due to scarce availability on account of HOC Cochin taking up maintenance shut down. There was good demand for phosphoric acid on account of commencement of sugar season. Despatches of TiO_2 from Travancore Titanium Products, Trivandrum have been affected due to confrontation with the transporters and if the situation continues, the prices of anatase grade material are expected to go up.

(MADRAS MARKET RATES AS ON OCTOBER 14, 1989)

Acetic Acid Glacial (per kg)	16.00
Aluminium Sulphate Iron free (per MT)	4,200.00
Ammonium Bicarbonate (per 25 kgs)	125.00
Ammonium Chloride (per MT)	3,000.00
Acid Slurry (per kg)	30.00
Barium Carbonate (per kg)	6.00
Barium Chloride (per kg)	5.25
Boric Acid Technical (per kg)	24.00
Bleaching Powder (per 50 kgs)	220.00
Borax (per 50 kgs)	685.00
Caustic Soda Flakes -- Mettur Chemicals (per MT)	11,800.00
Caustic Soda Flakes -- Andhra Sugars (per MT)	11,800.00
Calcium Chloride 70% Solid (per MT)	3,000.00
Calcium Chloride Anhydrous (per MT)	5,800.00
Calcium Carbonate (Activated) (per MT)	5,750.00
Calcium Carbonate (Precipitated) (per MT)	4,750.00
Citric Acid (per kg)	48.00
Copper Sulphate (per kg)	24.00
Cresylic Acid 98-99% (per kg)	130.00
Pure Para Cresol 96% (per kg)	80.00
Meta Para Cresol 42% (per kg)	50.00
Formic Acid (per kg)	27.00
Formaldehyde (per kg)	8.00
Glue Flakes (per kg)	15.00
Glycerine (per kg)	45.00
Hydrosulphite of Soda (TCPL) (per kg)	38.00
Hydrosulphite of Soda (IDI) (per kg)	42.00
Hydrosulphite of Soda (BASF) (per kg)	42.00
Hexamine (per kg)	29.00
Hyflo Supercell (per kg)	19.50
Hydrogen Peroxide (per kg)	29.00
Litharge (per kg)	40.00
Lead Acetate (per kg)	42.00
Magnesium Carbonate (per kg)	19.00
Magnesium Chloride (per kg)	3.25
Maleic Anhydride (per kg)	39.00
Menthol Crystals (per kg)	380.00
Oxalic Acid (per kg)	24.00
Paraffin Wax (per kg)	18.00
Potassium Bichromate (per kg)	36.00
Phosphoric Acid (per kg)	25.00
Polyvinyl Alcohol Powder (per kg)	135.00
Pentaerythritol (per kg)	52.00
Phthalic Anhydride (per kg)	30.00
Soda Ash (TAC) (per 75 kgs)	385.00
Soda Ash (TATA) (per 75 kgs)	385.00
Sodium Bicarbonate (TATA) (per 50 kgs)	375.00
Sodium Silicate (per MT)	3,500.00
Sodium Bichromate (per kg)	28.00
Sodium Nitrate (per kg)	8.00
Sodium Nitrite (per kg)	15.00
Sodium Sulphide Flakes (per kg)	12.00
Sodium Bisulphite (per kg)	4.50
Sodium Alginate (per kg)	220.00
Sodium Acetate (per kg)	7.00
Sodium Sulphate (Anhydrous) (per kg)	3.00
Titanium Dioxide (Anatase) (per kg)	105.00
Titanium Dioxide (Rutile) (per kg)	120.00
Trisodium Phosphate (per kg)	7.00
Urea (Technical) (per kg)	3.00
Zinc Oxide (per kg)	54.00
Zinc Chloride Powder (per kg)	12.00
Zinc Sulphate (per kg)	6.50

SOLVENTS

Acetone -- HOCL (per kg)	24.00
Butanol (per kg)	36.00
Butyl Acetate (per kg)	43.00
Benzene (per lit)	17.00
Cellosolve (per kg)	50.00
Carbon Tetra Chloride (per kg)	24.00
Chloroform (per kg)	28.00
Diacetone Alcohol (per kg)	30.00
Diethylene Glycol (per kg)	47.00
Dichloroethane (per kg)	17.00
Di-octyl Phthalate (per kg)	46.00
Di-N-butyl Phthalate (per kg)	48.00
Ethyl Acetate (per kg)	24.00
Isopropyl Alcohol (per kg)	35.00
Methanol (per kg)	10.00
Methylene Chloride (per kg)	24.00
Methyl Ethyl Ketone (per kg)	39.00
Methyl Isobutyl Ketone (per kg)	54.00
Phenol (per kg)	38.00
Sorbitol (per kg)	15.00
Triethanolamine (per kg)	60.00
Trichloroethylene (per kg)	25.00
1-1-1 Trichloroethane (per kg)	27.00
Turpentine (per lit)	16.50
Toluene (per lit)	18.00
Xylene (per lit)	23.00

Shipping News

VESSELS DUE IN BOMBAY FOR EXPORT LOADING

Due Date (1)	Steamer's Name & Flag (2)	Agents (3)	Will load for (4)	Approx. sailing dt. (5)
In Port	Ramdas (Ind)	S.C.I.	Felixstowe; Hamburg; Rotterdam; Antwerp; Bremen; Liverpool; Le Havre; Manchester; Avonmouth; London; Belfast; Aarhus; Oslo; Copenhagen; Gothenburg; Helsinki and all inland destinations. (Carting at Timber Pond No. 1).	26/10
20/10	Kremenchug (Rus)	Transocean	Odessa; Illyichevsk; Havana; (Cuba); Genoa; Trieste; Piraeus; Marseilles; Barcelona; Varna; Bourgas. (Carting at Timber Pond No. 4).	26/10
21/10	Eagle Star	F.F.C. Co.	Jeddah; P.Sudan; Hodeidah. (Carting at Timber Pond No. 1).	26/10
22/10	Mareike	U.L.A.	P. Sudan; Aden; Djibouti; Hodeidah.	28/10
24/10	Maersk Clementine	Volkart Fleming	Leghorn; Marseilles; Naples; Barcelona; Bilbao; Bordeaux; Alicante; Genova; Valencia; Bremen; Jeddah; Antwerp; Rotterdam; Bremerhaven; Hamburg; U.K. & Scandinavian ports. (Carting at M.O.D. No. 3).	28/10
25/10	Nedlloyd Himalaya (Nhava Sheva)	Patvolk/ S.W. & Co./ Trident/ P&O	Tilbury; London; Felixstowe; Avonmouth; Manchester; Liverpool; Glasgow; Leeds; Birmingham; Dublin; Belfast; Bristol; Marseilles; Genoa; Barcelona; Le Havre; Antwerp; Rotterdam; Hamburg; Bremerhaven; Copenhagen; Oslo; Helsinki; Malmao; Gothenburg; Stockholm; Aarhus; Alborg. (Carting at CFS for all).	27/10
26/10	Waterkoning	Samrat/ Hindustan/ Merzario	Felixstowe; Hamburg; Rotterdam also London; Liverpool; Leixoes; Lisbon; Manchester; Avonmouth; Wembly; Birmingham; Leicester; Le Havre; Amsterdam; Bremen; Antwerp; Copenhagen; Leeds; Aarhus; Gothenburg; Oslo; Stockholm; Helsinki; Belfast and all desinations in U.K., Benelux Germany; Italy; France; Switzerland and Austria. (Carting at M.O.D. No. 2 for Merzario)(Carting at M.O.D. No. 1 for Samrat and Hindustan).	1/11
26/10	Sam Houston	Samarth	Aqaba; Assab (Alexandria). (Carting at P/Q-PD).	27/10
26/10 28/10	CMB Merit/ CMB Plantin (Nhava Sheva)	C.M.B.	Djibouti; Port Sudan; Jeddah; La Spezia; Valencia; Genoa; Barcelona; Marseilles; Tunis; Casablanca; Tangier; Alexandria; Piraeus; Mersin; Limassol; Felixstowe; London; Liverpool; Manchester; Birmingham; Avonmouth; Dublin and all inland destinations in UK, Antwerp; Rotterdam; Hamburg; Bremen; Leixoes; Lisbon; Copenhagen; Oslo; Gothenburg; Stockholm; Malmao; Aarhus; Helsinki. (Carting at CFS).	28/10
28/10	Yulius Fuchik (Rus)(V-103 W/B)	Transocean	Odessa; Izmail; Reni (USSR); Russe Bulgaria; Budapest (Hungary); Linz; Vienna (Austria); Bratislava (Czechoslovakia); Deggendorff; Regenborg (West Germany). (All ports on River Danube).	29/10
20/10	Kremenchug	Transocean	Afghanistan. (Carting at Timber Pond No. 4).	26/10
21/10	Eagle Star	F.F.C. Co.	Colombo; Rangoon. (Carting at Timber Pond No. 1)	26/10
21/10	Eagle Star (V-019)(Cyp)	F.F.C. Co.	Penang; P. Kelang; Singapore; Bangkok; Jakarta (T. Priok); Hongkong; Manila; Busan; Keelung; Kaohsiung; Kobe; Yokohama; Nagoya; Osaka; Tokyo; Tsingtao; Dairen; Quangzhou; Whampoa; Shangai; Hsingkang. (Carting at Timber Pond No. 1).	26/10
24/10	M. Clementine (Sing)(V-8932)	Volkart Fleming	Penang; Singapore; Hongkong; Keelung; Kaohsiung; Busan; Main Japan ports; Manila; Jakarta; Surabaya; Bangkok; P. Keelang; Chinese ports. (Carting at M.O.D. No. 2).	28/10
25/10	Mandama	Killick/P&O/ I.M.E/	Singapore. (Carting at M-178/180 Cotton Depot for Killick) (Carting at T.P. 4 for P&Q) (Carting at Wadi Bunder No. 3 for I.M.E.).	28/10
26/10	Sam Houston	Samarth	Singapore. (Carting at P/Q-PD).	27/10
21/10	Eagle Star	F.F.C. Co.	Brisbane; Fremantle; Sydney; Melbourne; Adelaide. (Crtg. at TP No. 1).	26/10
25/10	Mandama (Voy-0566)	I.M.E./	Sydney; Melbourne; Adelaide; Freemantle; Brisbane; Auckland; Wellington; Lyttelton. (Carting at Wadi Bunder No. 3 for IME).	28/10
		Killick/ P&O	Melbourne; Sydney; Brisbane; Adelaide; Fremantle; P. Hobart; Devon P. Launceston; Burnie; P. Chalmers; Lyttelton; Christchurg; Dunedin; New Plymouth; Auckland; Wellington; Napier also Western Samoa; Papua; New Guinea; Solomon Island; American Samoa; Tonga; New Calidonia; Rabaul; P. Villa. (Carting at M-178/180 Cotton Depot for Killick)(Carting at Timber Pond No. 4 for P & O).	

(1)	(2)	(3)	(4)	(5)
21/10	Eagle Star (V-019)	F.F.C. Co.	Dubai; Sharjah; Abu Dhabi; Doha; Muscat; Dammam; Riyadh; Bahrain; Kuwait. (Carting at Timber Pond No. 1).	26/10
22/10	Mareike	U.L.A.	Dubai; Dammam; Kuwait; Bahrain; Riyadh; Abu Dhabi; Doha.	28/10
24/10	Maersk Clementing	V. Fleming	Dubai; Dammam; Muscat; Bahrain; Kuwait; Riyadh; Doha. (Carting at M.O.D. No.2).	28/10
26/10	CMB Merit (NS)	C.M.B.	Dubai; Abhi Dhabi; Bahrain; Kuwait; Dammam; Doha. (Crtg. at CFS).	28/10
28/10	CMB Plantin (Nhava Sheva)	C.M.B.	Dar Es Salaam; Mombasa (Direct); Nacala; Tanga; Kampala; Blantyre; Lusaka; Ndola; Matwara; Lilongwe and all inland destinations in East Africa. (Carting at CFS).	30/10
In port	Ramdas (Ind)	S.C.I.	New York; Baltimore; Savannah (Direct) and other inland destinations. (Carting at Timber Pond No. 1).	26/10
21/10	Eagle Star (V-019)	F.F.C. Co.	Los Angeles (Harbour); Longbeach; Sanfrancisco; Oakland; Seattle; Vancouver (B.C.); Portland; New York; Boston; Norfolk; Baltimore; Charleston; Savannah; Miami; New Orleans; Houston; Montreal; Toronto; Fortworth; Chicago; Nashville; Atlanta; Philadelphia; Milwaukee; Kansas City; Phoenix; Guam; Dallas; Cleveland; St. Louis; Cincinnati; Denver; Louisville; Memphis; Wilmington (B.C.); San Diego; Minneapolis; Indianapolis and Central American Ports; Honolulu. (Carting at Timber Pond No. 1).	26/10
24/10	Maersk Clementine (Sing)(V-8932)	Volkart Fleming	New York; Philadelphia; Baltimore; Norfolk; Charleston; Savannah; Jacksonville; Miami; New Orleans; Houston; Toronto; Montreal; Chicago; Atlanta; Denver; Dallas; Wilmington; Milwaukee; Detroit; Minneapolis; Memphis; Nashville; Cleveland; Phoenix; Boston; Los Angeles; Vancouver; Seattle; Sanfrancisco; Portland; Longbeach; Mexican and S. American ports. (Carting at M.O.D. No. 2).	28/10
25/10	Nedlloyd Himalaya (Nhava Sheva)	Patvolk/P&O/ S.W. & Co./ Trident	S. American ports. New York; Norfolk; Savannah; Baltimore; Boston; Charleston; Houston. (Carting at CFS for all).	27/10
25/10	Mandama	Killick	S. American ports. (Carting at 178/180 Cotton Depot).	28/10
26/10	Sam Houston (AME)	Samarth	Philadelphia; Baltimore; Norfolk; New Orleans; Houston; Savannah; New York. (Carting at P/Q-PD).	27/10
26/10 28/10	CMB Merit/ CMB Plantin (Nhava Sheva)	C.M.B.	Norfolk; New York; Baltimore; Philadelphia; Charleston; Savannah; Houston; Miami; New Orleans; Via Antwerp; Montreal; Toronto; Halifax. (Carting at CFS).	28/10 30/10
24/10	Maersk Clementine	V. Fleming	Lagos/Apapa; Dakar; Freetown; Monrovia; Lome; Cotonou; Douala; Tema. (Carting at M.O.D. No. 2).	28/10
25/10	Nedlloyd Himalaya (Nhava Sheva)	Patvolk/ Trident/P&O/ S.W. & Co.	West African ports. (Carting at CFS for all).	27/10
26/10	Waterkoning	Merzaio	Dakar; Abidjan; Monrovia; Lome; Douala; P. Noire; Matadi; Libreville; Cotonou; P. Gentil; Lagos; P. Harcourt; Warri; Freetown; Conakry; Louanda; Nouakchott; Guinea; Blassa. (Carting at M.O.D. No. 2).	1/11
26/10 28/10	CMB Merit/ CMB Plantin (Nhava Sheva)	C.M.B.	Lagos; Abidjan; Lome; Douala; Matadi; Port Gentil; Pointe Noire; Nouakchott; Cotonou; Dakar; Luanda; Monrovia; Tema; Via Antwerp. (Carting at CFS).	28/10 30/10

VESSELS DUE IN BOMBAY FOR IMPORT DISCHARGE

Due Date	Steamer's Name	Agents	From
26/10	CMB Merit (Nhava Sheva)	C.M.B.	U.K. Cont./U.S., Med. Ports.
30/10	Herceg Novi	S.C.I.	U.S./Canada
31/10	Ind. Goodwill	I.S.S. Co.	U.K. Cont.
28/10	Piva	F.F.C. Co.	Cont.
27/10	S/o Gujarat	S.C.I.	U.K. Cont.
30/10	Vishva Parag	S.C.I.	U.K. Cont/U.S.
26/10	Waterkoning	Merzario/Samrat	U.K. Cont.
28/10	Yulius Fuchik (Voy-103)	Transocean	Rus./E. Europe.

Materials Imported

BOMBAY
(From 8.6.89 to 14.6.89)
(Contd. from previous issue)

METHYL PARATHION TECH: From GDR: Bharat Pesticides Inds. Pvt. Ltd., 16,120 Kgs., Rs. 5,52,191.

MONOCHLORACETYL CHLORIDE: From FRG: Hindustan Insecticides Ltd., 1 Box, Rs. 182.

MONOCROTOPHOS TECH: From Switzerland: Kilpest Pvt. Ltd., 16,280 Kgs., Rs. 15,62,715; Northern Minerals Ltd., 16,280 Kgs., Rs. 13,37,021.

MONOETHYLENE GLYCOL: From FRG: The Baroda Rayon Corpn. Ltd., 128,800 MTs., Rs. 30,40,203; Modipon Fibres Co., 55,200 Kgs., Rs. 13,86,507.

N-MONOMETHYL CYCLOHEXYLAMINE: From FRG: GDR Chemicals Pvt. Ltd., 340 Kgs., RS. 26,400.

MONOSODIUM GLUTAMATE 99%: From France: Kapex Chemicals Pvt. Ltd., 18 MTs., Rs. 3,82,386.

PARAFORMALDEHYDE 96%: From Spain: J.P. Chemical Industries, 18,000 Kgs., Rs. 1,60,672.

D(-)ALPHA PHENYL GLYCINE CHLORIDE HCL: From Netherlands: Armour Chemicals Ltd., 5,775 Kgs., Rs. 19,24,765.

PIVALOYL CHLORIDE: From France: Ranbaxy Laboratories Ltd., 2,880 Kgs., Rs. 1,86,046.

POTASSIUM FERRO CYANIDE: From FRG: Speciality Chemicals, 4,000 Kgs., RS. 76,792.

PROPYLENE GLYCOL USP: From USA: Indian Gum Inds. Ltd., 50,310 Kgs., Rs. 11,16,270.

SILICON METAL: From Singapore: Nikhil Alloy Steels Pvt. Ltd., 16.593 MTs., Rs. 2,87,958.

TETRADECYL BROMIDE: From USA: Hico Products Ltd., 7,120 Kgs., Rs. 5,50,315.

TETRAHYDROFURAN: From FRG: Glindia Limited, 14,040 Kgs., Rs. 6,48,191; Lupin Laboratories Ltd., 14,040 Kgs., Rs. 6,12,835.

TITANIUM DIOXIDE: From FRG: Century Enka Ltd., 17,500 Kgs., Rs. 7,71,066.

TITANIUM TETRACHLORIDE: From France: Sudarshan Chemical Inds., 2,560 Kgs., Rs. 73,101.

TOLUENE DI ISOCYANATE: From USA: Hindustan Ciba Geigy Ltd., 19 MTs., Rs. 7,02,614.

TRIMETHYL HEXAMETHYLENE DIAMINE: From FRG: Dr. Beck & Co. (I) Ltd., 540 Kgs., Rs. 67,992.

TRIMETHYL PHOSPHITE: From USA: Khatau Junker Ltd., 33.2 MTs., Rs. 12,24,028; Sudarshan Chemical Inds., 32,060.48 Kgs., Rs. 11,74,806.

3,4,5 TRIMETHOXY BENZALDEHYDE: From China: Marvel Drugs Pvt. Ltd., 2,000 Kgs., Rs. 7,23,858; From Japan: Zora Pharma Pvt. Ltd., 2,010 Kgs., Rs. 7,14,825.

3,4,5 TRIMETHOXY BENZOIC ACID: From Spain: Themis Agencies, 1,000 Kgs., Rs. 1,26,675.

VANILLIN: From France: Jagatjit Inds. Ltd., 1,250 Kgs., Rs. 3,12,586.

MATERIALS IMPORTED
BOMBAY
(From 15.6.89 to 16.6.89)

AROMATIC CHEMICALS: From FRG: Calcutta Perfumery Works Pvt. Ltd., 100 Kgs., Rs. 35,256.

SECONDARY BUTYL BENZENE: From UK: McDowell & Co. Ltd., 2,520 Kgs., Rs. 2,54,832.

CAPROLACTAM: From Belgium: The Baroda Rayon Corpn. Ltd., 185 MTs., Rs. 55,31,218.

CARBON BLACK: From USA: EL Ltd., 907 Kgs., Rs. 1,29,923.

DESMODUR: From FRG: Mahindra Engineering & Chemicals, 4,000 Kgs., Rs. 1,67,882.

DICUMYL PEROXIDE: From Japan: Maharashtra Chemicals & Rubber, 1 MT., Rs. 39,416.

DIMETHYL LAURYLAMINE: From Japan: Galaxy Organics (P) Ltd., 4,960 Kgs., Rs. 2,60,672.

DIPHENYLMETHANE DIISOCYANATE: From FRG: Premier Auto Electric Ltd., 500 Kgs., Rs. 9,520.

HEXACHLOROCYCLOLPENTADIENE: From USA: Bharat Pulverising Mills Ltd., 80,014 Kgs., Rs. 22,95,346.

IODINE CRUDE 99.5%: From Japan: Popular Pharma Chem Ltd., 1 MT Rs. 2,99,772.

LAB CHEMICALS: From USA: Biological E. Ltd., 63.56 Kgs., Rs. 77,107.

LITHIUM METAL: From USA: Roche Products Ltd., 500 Kgs., Rs. 4,22,041.

L-LYSINE MONOHYDROCHLORIDE PHARMA GRADE: From Japan: Cyanamid India Ltd., 1,000 Kgs., Rs. 86,548.

MONOCROTOPHOS TECH: From Switzerland: Bharat Pulverising Mills Ltd., 16,280 Kgs., Rs. 13,32,021.

ORTHOXYLENE: From Italy: Shri Ambuja Petro Chemicals Ltd., 1,000 MTs., Rs. 30,34,392.

D-PANTHENOL USP: From Sweden: Biological E. Ltd., 200 Kgs., Rs. 58,223.

PATCHOULI OIL: From Indonesia: FFG Aromas Pvt. Ltd., 1,000 Kgs., Rs. 2,93,477; Industrial Perfumers Ltd., 100 Kgs., Rs. 36,192.

POTASSIUM CARBONATE 99/100%: From France: Navin Fluorine Inds., 18,000 Kgs., Rs. 1,77,031.

POTASSIUM CARBONATE: From Japan: G. Amphray Laboratories, 17,500 Kgs., Rs. 1,73,490.

POTASSIUM FERRO CYANIDE: From GDR: Zora Pharma Pvt. Ltd., 5,000 Kgs., Rs. 1,06,291.

POTASSIUM PERMANGANATE BP 80: From China: Dyes Distributors India Ltd., 20,000 Kgs., Rs. 2,67,514.

PROPYLENE GLYCOL: From Japan: Rallis India Ltd., 16,000 Kgs., Rs. 3,39,900; From USA: Kushalchand Sons, 16,770 Kgs., Rs. 3,72,090.

PROPYLENE GLYCOL USP: From Japan: Vitril Pharma Products Ltd., 16,170 Kgs., Rs. 3,58,573.

TITANIUM DIOXIDE: From Italy: Bombay Paint & Allied Products, 5,000 Kgs., Rs. 1,97,094.

DYE MATERIALS IMPORTED BOMBAY
(From 15.6.89 to 16.6.89)

DYE INTERMEDIATES: From FRG: Bharat Texdyes Inds., 655 Kgs., Rs. 1,39,342; La Chemica, 698 Kgs., Rs. 1,39,342.

MATERIALS IMPORTED MADRAS
(From 1.9.89 to 16.9.89)

ALDEHYDE: From Switzerland: Karnataka Soaps & Detergents Ltd., 100 Kgs., Rs. 45,438.

ALDEHYDE C10: From FRG: Ambica Chemical Products, 144 Kgs., Rs. 22,779.

ACETYL CHLORIDE: From FRG: Cheminor Drugs Pvt. Ltd., 72,200 Kgs., Rs. 17,10,405.

AMMONIUM PENTABORATE: From FRG: Keltron, 2,500 Kgs., Rs. 1,32,534.

AROMATIC CHEMICALS: From France: Parmal Mandir, 500 Kgs.,

Rs. 1,29,704.

BIO CHEMICALS: From USA: Chandanmal & Co., 10 Kgs., Rs. 28,225; CLRI., 210 Grms., Rs. 2,417.

CAUSTIC SODA FLAKES: From FRG: Standard Organics Ltd., 1,00,000 Kgs., Rs. 8,17,465.

2-CHLOROPHENOTHIAZENE: From France: Eskayef Ltd., 10 Kgs., Rs. 25,044.

CITRONELLOL: From FRG: Padmini Products, 1,020 Kgs., Rs. 1,50,011.

ORTHO DICHLOROBENZENE: From Japan: Benzex Labs. Ltd., 16,250 Kgs., Rs. 3,68,377.

DICUMYL PEROXIDE: From China: Peroxides India Ltd., 4 MTs., Rs. 1,90,186.

DIETHYL CARBAMAZINE BP 80: From China: Medophar, 240Kgs., Rs. 54,454.

DIETHYL CARBAZEN CITRATE: From Hungary: Tamil Nadu Dadha Pharmaceuticals Ltd., 250 Kgs., Rs. 59,738.

DIETHYLENE GLYCOL: From Singapore: Ven Ponn Tannery, 29,440 Kgs., Rs. 3,02,055.

DIMETHYL AMINO PROPYLAMINE: From FRG: SIP Resins Ltd., 1,280 Kgs., Rs. 69,062.

DIMETOL: From Switzerland: Karnataka Soaps & Detergents Ltd., 9 Kgs., Rs. 3,856.

ETHYL ACETO ACETATE: From FRG: TTK Chemicals Ltd., 3,000 Kgs., Rs. 1,05,103.

ETHYL CYANO ACETATE: From Japan: Aromax Chemicals, 200 Kgs., Rs. 33,408.

ETHYL GLYCOL: From USA: R.K. Chemicals, 14,820 Kgs., Rs. 3,14,494.

EUGENOL PURE: From Singapore: Vasu Agarbathies, 25 Kgs., Rs. 2,503.

FORMIC ACID: From FRG: Namaska Leather Garments, 10,224.5 Kgs., Rs. 1,11,268.

HYDRAZINE HYDRATE: From FRG: Standard Organics Ltd., 15,200 Kgs., Rs. 4,69,125.

HYDROXYACETIC ACID 70% SOLN: From USA: Chemicals & Plastics India Ltd., 249 Kgs., Rs. 13,608.

HYDROXYLAMINE SULPHATE: From Japan: Kishore Organics Pvt. Ltd., 10 MTs., Rs. 2,73,618; From USA: Vogel Labs Pvt. Ltd., 32 MTs., Rs. 8,48,216.

D(-) PARA HYDROXYPHENYL GLYCINE: From Italy: TTK Chemicals Ltd., 1,000 Kgs., Rs. 3,67,026; From Singapore: TTK Chemicals Ltd., 1,000 Kgs., Rs. 3,67,025.

HYDROXY PROPYL METHYL CELLULOSE: From Japan: Southern Capsulation Pvt. Ltd., 50 Kgs., Rs. 46,860.

ISO BORNYL METHOXY CYCLOHEXANONE: From Japan N. Ranga Rao & Sons, 1,000 Kgs. Rs. 1,94,357.

ISOBUTYL BENZENE: From USA Shasun Drugs, 13,657 Kgs. Rs. 7,47,338; Vorin Labs. Pvt. Ltd. 1,02,400 Kgs., Rs. 12,04,377.

ISOPROPYL ALCOHOL: From China: Venkatarama Chemicals Ltd. 12,800 Kgs., Rs. 1,51,615.

LABORATORY CHEMICALS From USA: Astra Research Centre, 17 Nos., Rs. 32,933.

LINALOL: From France: Chaitanya Perfumery Works, 100 Kgs. Rs. 12,097; From Switzerland: Onam Agarbathi Co., 1,050 Kgs. Rs. 1,48,884.

LINALOOL: From FRG: Ponds India Ltd., 4,000 Kgs., Rs. 3,81,438; From USA: B.V. Aswathiah & Bros., 181 Kgs., Rs. 25,365; From USA Prad-

ham Perfumers, 101 Kgs., Rs. 25,818; Shalimar Agarbathi Co., 1,452 Kgs., Rs. 2,03,478; Vinaram Pvt. Ltd., 726 Kgs., Rs. 1,00,940.

LINALYL ACETATE: From USA: Vinaram Pvt. Ltd., 720 Kgs., Rs. 1,18,696.

LYSINE MONO HYDROCHLORINE: From Japan: Komarla Feeds, 2,000 Kgs., Rs. 1,40,137.

MERCAPTOBENZIMIDAZOLE: From Japan: Shriram Fibres Ltd., 2,400 Kgs., Rs. 4,29,525.

METHYL ETHYL KETONE: From France: J.K. Magnetics, 27.2 MTs., Rs. 3,65,292.

METHYLENE CHLORIDE: From Netherlands: Flavours & Fragrances Pvt. Ltd., 19,890 Kgs., Rs. 1,97,758; Plant Organics Ltd., 38,880 Kgs., Rs. 3,95,610.

METHYLENE DIAMINE: From Japan: SIP Resins Ltd., 6,000 Kgs., Rs. 3,75,367.

MONOCROTOPHOS TECH: From Switzerland: GAIC Ltd., 16,200 Kgs., Rs. 13,78,868.

ALPHA NAPHTHOL: From Japan: ICI India Ltd., 2,000 Kgs., Rs. 2,33,852.

NITRIC ACID: From FRG: BEL, 608 Kgs., Rs. 66,604.

PERCHLORO ETHYLENE: From Netherlands: JBE Industries, 40,300 Kgs., Rs. 3,69,778.

PHENOL: From FRG: Vanavil Dyes & Chemicals, 11,000 Kgs., Rs. 2,56,592.

PHENOXY ETHANOL: From Singapore: Reliable Industrial Syndicate, 1,000 Kgs., Rs. 33,366.

D(-)ALPHA PHENYL GLYCINE: From Netherlands: SOL Pharmaceuticals Ltd., 1,005 Kgs., Rs. 3,89,098.

PHOSPHORIC ACID: From USA: Madras Fertilizers, 8148.198 MTs., Rs. 5,07,76,865.

POLYVINYL ALCOHOL: From Japan: Chemicals & Plastics India Ltd., 120 Kgs., Rs. 8,653; W.S. Industries India Ltd., 1,000 Kgs., Rs. 46,712.

PROPYLENE GYLCOL JP/USP: K. Uttamlal (Exports) Pvt. Ltd., 6,000 Kgs., Rs. 1,35,310.

PROPYLENE GYLCOL USP: From Japan: Bush Boake Allen (India) Ltd., 33,540 Kgs., Rs. 7,34,685.

PYRIDINE PURE 2°: From Japan: IEL Chemic Tech Pvt. Ltd., 975 Kgs., Rs. 66,890; Standard Organics Ltd., 15.6 MTs., Rs. 9,67,862.

ROCK PHOSPHATE: From Jordan: Kothari Industrial Corpn. Ltd., 7,000 MTs., Rs. 80,93,472.

SELENIUM DIOXIDE: From Japan: TPS Laboratories Pvt. Ltd., 500 Kgs., Rs. 1,69,749.

SODIUM CYANIDE: From FRG: Pacific Exports, 10,200 Kgs., Rs. 1,88,850.

SODIUM HYDROSULPHATE: From China: Plant Organics Ltd., 3,400 Kgs., Rs. 76,575.

SULPHUR: From UK: Fenner (India) Ltd., 1 MT., Rs. 18,771.

TITANIUM DIOXIDE RUTILE: From Singapore: Addisons Paints & Chemicals Ltd., 17 MTs., Rs. 7,69,787.

TITANIUM DIOXIDE: From Singapore: Shreyas & Co., 18,144 Kgs., Rs. 4,08,639.

TRIETHYL ORTHO PROPIONATE: From Switzerland: Tamil Nadu Dadha Pharmaceuticals Ltd., 50 Kgs., Rs. 1,06,955.

TRIETHYLENE GLYCOL PURE: From FRG: Anabond Pvt. Ltd., 2,200 Kgs., Rs. 83,315.

2-TRIFLUOROMETHYL PHENOTHIAZINE: From France: Eskayef Ltd., 10 Kgs., Rs. 37,557.

VANILLIN: From France: Padmini

Products, 500 Kgs., Rs. 1,37,635.

VANILLIN TECH: From USA: Dr. Reddy's Laboratories Ltd., 10,500 Kgs., Rs. 23,64,811.

ZINC STEARATE: From UK: Sundaram Fastners Ltd., 1,750 Kgs., Rs. 53,297.

MATERIALS IMPORTED BOMBAY (From 19.6.89 to 23.9.89)

ACRYLAMIDE: From Japan: Hico Products Ltd., 7,000 Kgs., Rs. 1,63,778; Pharma Chem Intl., 2,500 Kgs., Rs. 1,65,778.

ACRYLIC ACID: From Japan: BASF India Ltd., 16,000 Kgs., Rs. 4,72,038; Vipul Industrial Products, 16,000 Kgs., Rs. 4,98,516.

ALDEHYDE: From FRG: Arora Chemicals, 200 Kgs., Rs. 64,634; Industrial Perfumes Ltd., 22 Kgs., Rs. 27,556.

ALMOND OIL: From USA: American Dry Fruit Stores, 91 Kgs., Rs. 8,920.

ALPHA ACETO GAMMA BUTYRO LACTONE: From Japan: Indian Drugs & Pharmaceuticals Ltd., 10,000 Kgs., Rs. 13,09,814.

ALPHA 8,9,8 ISOPROPANOL: From USA: Bharat Heavy Electricals Ltd., 11 Nos., Rs. 16,614.

ALPHA OLEFIN: From USA: Godrej Soaps Ltd., 524.944 MTs., Rs. 82,24,458.

ALUMINIUM OXIDE: From USA: Grindwel Norton Ltd., 4,990 Kgs., Rs. 3,02,785.

ALUMINIUM SILICATE: From USA: Berger Paints India Ltd., 2,838 Kgs., Rs. 1,03,709.

ALPHA PHENYL GLYCINE CHLORIDE HYDROCHLORIDE: From Switzerland: Ranbaxy Labs. Ltd., 9,660 Kgs., Rs. 33,19,066.

AMINO DIACETIC ACID: From Japan: Excel Inds Ltd., 21,600 Kgs., Rs. 71,87,809.

BASE AMINO DIOL: From China: Kevin Chemicals, 500 Kgs., Rs. 3,91,434.

ORTHO AMINOPHENYL ORTHO CRESYL ETHER: From FRG: Mohanlal & Co., 630 Kgs., Rs. 1,20,614.

AMYL ALCOHOL: From FRG: Lubrizol India Ltd., 199.827 MTs., Rs. 29,37,631.

ANILINE OIL: From Portugal: Polyolefins India Ltd., 32 MTs., Rs. 7,93,096.

ANTIOXIDANT: From Japan: Sandeep Enterprises Pvt. Ltd., 300 Kgs., Rs. 62,609.

ANTIMONY TRIOXIDE: From France: Century Enka Ltd., 3,000 Kgs., Rs. 2,01,389.

ANTIMONY TRISULPHIDE: From Australia: Hindustan Ferodos Ltd., 2,000 Kgs., Rs. 1,58,788.

AROMATIC CHEMICALS: From UK: Cosmair Products, 2,572 Kgs. Rs. 4,78,778.

ARSENIC METAL: From China Punitar Metal Works Pvt. Ltd., 1.2 MTs., Rs. 33,990.

4-B ACID: From UK: Goodlass Nerolac Paints, 3041.92 Kgs. Rs. 1,85,019.

TETRA BROMO BISPHENOL From Netherlands: Cibatul Ltd., 3,000 Kgs., Rs. 1,20,381.

N-BUTYRIC ACID: From FRG Gupta & Co. Ltd., 1,000 Kgs. Rs. 24,343.

CAPROLACTUM: From USA Garware Nylons Ltd., 125,000 Kgs. Rs. 30,19,289.

CARBON BLACK: From Mexico Modi Rubber Ltd., 1,45,152 Kgs. Rs. 17,35,930.

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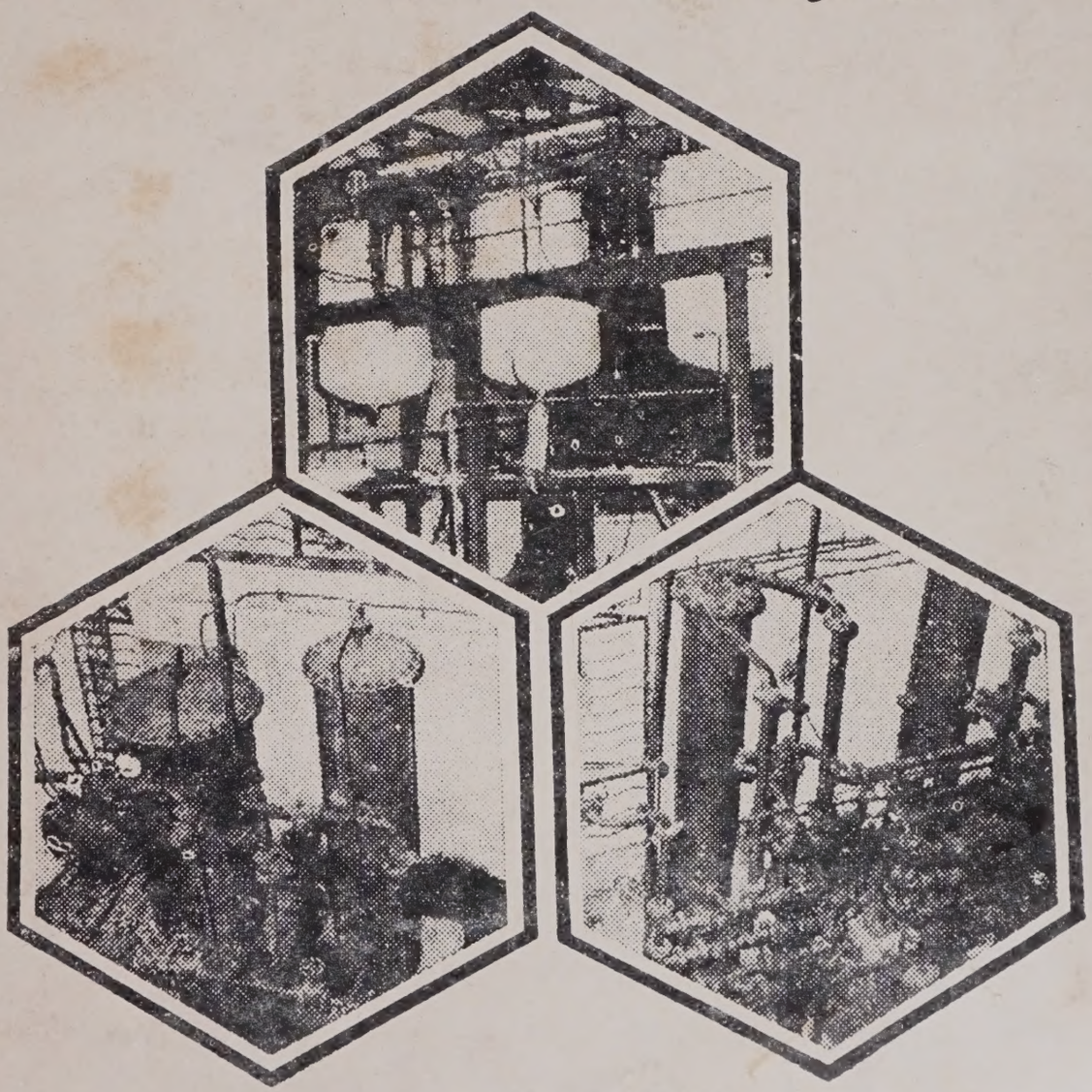

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